

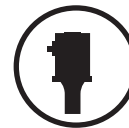
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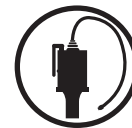
iQ Series

ULTRASONIC GENERATOR/POWER SUPPLY

LS-E



AUTOMATED



HAND PROBE



PRESS

User's Manual



Dukane Part No. 403-588-00

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ISO 9001 Products are manufactured in ISO registered facilities.



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This user’s manual documents product features, hardware, and controls software available at the time this user's manual was published.

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Revision History

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SECTION 1

Introduction

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General User Information

Read the Manual First

Before operating your ultrasonic generator, read this User's Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this generator. The examples given are chosen for their simplicity to illustrate basic operation concepts.

Notes, Cautions and Warnings

Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They have important information that, if ignored, could have increasingly severe outcomes. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or an operator protection issue.

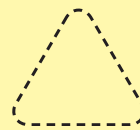
Drawings and Tables

The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. 1, 2, 3) while the tables use roman sequence numerals (e.g. I, II, III). As an example, Figure 3-2 would be the second illustration in Section 3 while Table 3-II would be the second table in Section 3.

NOTE

Note statements provide additional information or highlight procedures.

CAUTION



Caution statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING



Warning statements point out conditions or practices that could result in personal injury or loss of life.



Condition
or Practice



Electrical
Hazard



Hearing
Protection

Generator Overview

This generator is designed for basic ultrasonic applications that use either manually operated hand probes or ultrasonic probes controlled by automation systems. Using the available system control inputs and output status signals, it can easily be controlled by automated machines.

The generator design accepts several control input signals, and provides system status output signals.

This product has rugged internal ultrasonic generator circuitry and ensures a continuous resonant frequency lock at the start of each weld.

Users may program the generator setup parameters to meet a wide variety of ultrasonic processing requirements.

The generator's compact size allows multiple units to be placed into an industrial equipment cabinet. This generator will operate at the same international line voltage input specifications as the other generators of this product family (unless the 120V option is installed). It also includes an RFI line filter that passes FCC, CE, UL, and CSA testing for global applications.

Key Generator Features

- **Program the Generator** with up to 16 setups.
- **Process Parameters** such as frequency, amplitude and power are all updated at a .5 ms rate.
- **Pulse Width Modulation** incorporates patented circuitry giving the power supply the ability to efficiently change the output amplitude. This makes it possible to start large horns with reduced power. It also provides more power-efficient switch-mode generator operation and increased reliability.
- **Linear Ramp Soft-Start** circuitry allows the acoustic stack to be brought to operating amplitude smoothly, minimizing start-up surges and abnormal stress to the stack and generator.
- **Automatic Tuning** tracks the resonant frequency of the acoustic stack (horn, booster, transducer) and adjusts the generator output frequency to match it. This is done for every weld cycle and eliminates the need to manually tune the generator.
- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation. The available output power is maintained with any voltage input within the specified range. This provides consistent system performance regardless of line voltage fluctuations. It also eliminates the need for bulky, external constant-voltage transformers.
- **Load Regulation** provides constant ultrasound amplitude automatically regardless of power draw. The ultrasonic output amplitude level is held to within $\pm 1\%$ to provide weld process consistency and reduced weld cycle times.
- **High Line Voltage Power Supply** means that standard systems will operate worldwide at the local high line voltage level, whether it is 200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 208VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation.
- **Low Line Voltage Power Supply** - This optional 120V power supply is designed for North American applications.
- **Flow Through Cooling Tunnel** with a matched high-performance heat sink and thermostatically controlled fan reduces thermal gradients and increases component life.
- **AC Power Inrush** protection reduces electrical stress on the internal components by protecting them from AC power startup transient current surges.
- **Multiple Electronic Overload** protection circuits prevent instantaneous component failure in the event of extreme output overload conditions. The overload power limit is based on the actual true RMS power output level.
- **Process Limits** include: time only, time and energy, and peak power. These programmable limits provide the means to adapt to a wide variety of welding applications.
- **Control Board Option Modules** - The user can select one of the following: Multi-Probe Control, Automation Thruster Control, or Remote Amplitude Control.
- **CE Certification** means that the system meets the required European standards to be sold and used in Europe (high line voltage models only).
- **ISO 9001 Certification** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.
- **TUV Certification** - TÜV Rheinland certifies Dukane products comply with applicable UL (Underwriters Laboratories) and CSA (Canadian Standards Association) requirements.

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Health and Safety

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General Considerations

Please observe these **health and safety recommendations** for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane Corporation. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless directed to do so by Dukane Corporation. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

See *Electrical Safety* for grounding instructions, Page 9.

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System E-STOP (abort) Switch - Install a system E-STOP (abort) switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

Foot Switch - Do not use a foot switch. Using a foot switch in place of the optical touch finger switches (operate switches) violates OSHA regulations.

NOTE

These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. Typical of the *iQ Series* LS-E system consists of the *iQ* generator, cables, transducer, booster, horn, and fixture.

WARNING



Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary. Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

WARNING



Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION



At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the unit electrically from the incoming line AC power. If the unit is a press/thruster, lock the Air Lockout Valve, located on the rear panel, in its closed position.

Continued

Continued from Previous Page

General Considerations

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

Do Not Wear Loose Clothing or Jewelry - They can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand.

Do Not Operate the Equipment - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the equipment. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Plastics Health Notice

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator's health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

Electrical Safety

The *iQ Series* generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.

CAUTION



Parts being joined ultrasonically will at times vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system. Ultrasound pressure level could exceed 110dB. See Ultrasonic Pressure, Table 13-III, Page 120.

WARNING



Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

CAUTION



When making cable connections to system equipment or disconnecting cables from system equipment, make sure electrical power to the system is turned off, and AC power cords are removed from their receptacles. After the cables have been securely connected and the connections and cable routing checked a final time, the power may be restored.

Continued

Continued from Previous Page

Electrical Safety

Domestic Power Grounding

For safety, the power cords used on this product have a three-wire, grounding-type power cord. Figure 2-1 illustrates the appropriate electrical outlet to use with the power cord that is included with systems shipped to North America.

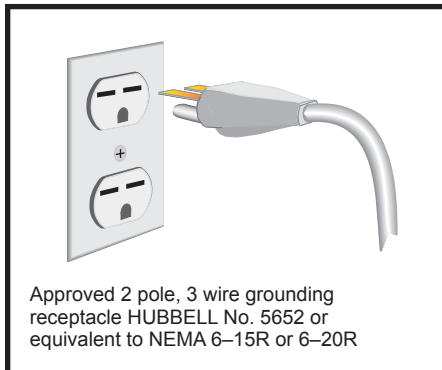


Figure 2-1 Example of 220/240 Volt, Grounded, 3-Prong Receptacle

International Power Grounding

The power cable normally provided for international use is compatible with the power outlet used in many Continental European countries (Refer to Figure 2-2.) However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

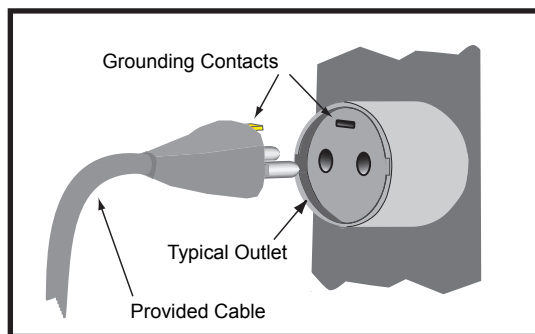


Figure 2-2 International 220/240V Grounding

CAUTION



If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply. See Figures 2-1 and 2-2.

CAUTION



If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

100/120 Volt AC Systems (North America or Japan)

The power cord (including strain relief) supplied with the 100/120VAC systems is permanently attached to the rear of the generator. Units with this power cord are for use in North America or Japan.

240 Volt AC Systems

High power generators with power ratings above 2400W also use permanently attached power cords.

Lifting the Equipment

How to Lift Safely

- Before lifting, take a moment to think about what you're about to do.
- Examine the object for sharp corners, slippery spots or other potential hazards. Know your limit and don't try to exceed it.
- Ask for help if needed, or if possible, divide the load to make it lighter.
- Know where you are going to set the item down, and make sure it and your path are free of obstructions. Then follow these steps:
 1. Stand close to the load with your feet spread apart about shoulder width, with one foot slightly in front of the other for balance.
 2. Squat down bending at the knees (not your waist). Tuck your chin while keeping your back as vertical as possible.
 3. Get a firm grasp of the object before beginning the lift. Begin slowly lifting with your LEGS by straightening them. Never twist your body during this step.
 4. Once the lift is complete, keep the object as close to the body as possible. As the load's center of gravity moves away from the body, there is a dramatic increase in stress to the lumbar region of the back.
 5. If you must turn while carrying the load, turn using your feet-not your torso. To place the object below the level of your waist, follow the same procedures in reverse order. Remember, keep your back as vertical as possible and bend at the knees.

NOTE

For equipment weights see Page 118, Table 13-I in **Section 13, Specifications**.



CAUTION

Take care when lifting the equipment. We recommend using a mechanical lift device to assist.

SECTION 3

Installation

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Before Installation

As you plan for the installation of your generator, please consider these important subjects as listed below:

- When to use lockout / tagout devices
- Lifting the generator safely - See *Section 2 - Health and Safety*, Page 9

When to Use Lockout / Tagout Devices



Figure 3-1 Lockout Device In Open Position, Unlocked

The typical kind of LOTO device for this generator is a clam shell type device (with lockout capability). The LOTO device is placed over the plug end of the generator electrical cord. This effectively prevents access to the energy isolation point. See the example of one such device in the figure above.

The figure to the right shows the lockout device in the closed, locked position.

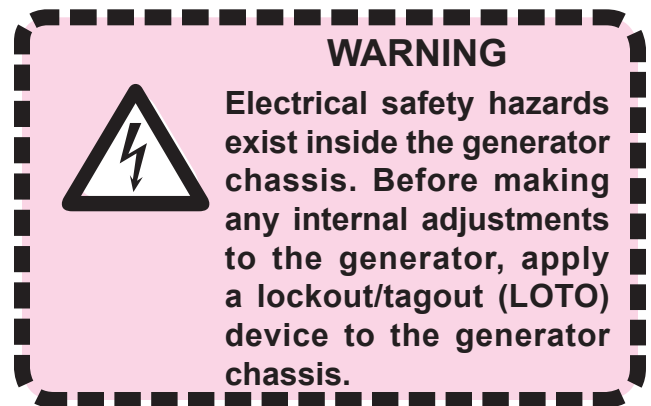


Figure 3-2 Bottom Lockout Device In Closed Position, Locked

Continued

Lockout/Tagout

Procedure to use BEFORE making any internal adjustments to the generator:

1. Push the generator's AC power switch/breaker to the OFF position.
 2. Unplug the generator's electrical cord from its source.
 3. Authorized personnel apply a lockout/tagout (LOTO) device to the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
 - 1) Open the clam shell.
 - 2) Place the electrical cord plug end inside the shell.
 - 3) Close the shell.
 - 4) Secure the shell with its lock, and lock it.
 4. Wait a minimum of five minutes for the generator to discharge its electrical energy.
 5. After taking these steps, make the necessary adjustments to the generator.
-

Assuming the generator is being put back into service. . .

Procedure to use AFTER making any internal adjustments to the generator:

1. Authorized personnel remove the lockout/tagout device from the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
 - 1) Unlock the protective shell.
 - 2) Open the shell, exposing the electrical cord end.
 - 3) Remove the LOTO device, and set it aside.
2. Plug the generator's electrical cord into its AC power source.
3. Push the generator's AC power switch/breaker to the ON position.

Unpacking

Carefully open your shipping container, and make sure it contains the items shown on the shipping documents. Inspect all items, and report any damage immediately.

Placement

Generator placement and cable routing should permit easy access and not interfere with normal system operation.

Allow at least 5 inches (13 cm) of space on both ends of the generator chassis for air circulation. Allow a 3 inch space (8 cm) at the rear of the chassis for cable clearance.

See *Section 13 - Specifications*, for generator drawings.



CAUTION

Allow 5 inches for air ventilation at the cooling air inlet and at the exhaust air outlet. The fan draws in fresh air to cool the internal components, reduce thermal gradients and increase component life.

If excessive dust accumulates in the slots, wipe or vacuum them clean. Do not use compressed air as this may force the dust inside the chassis.

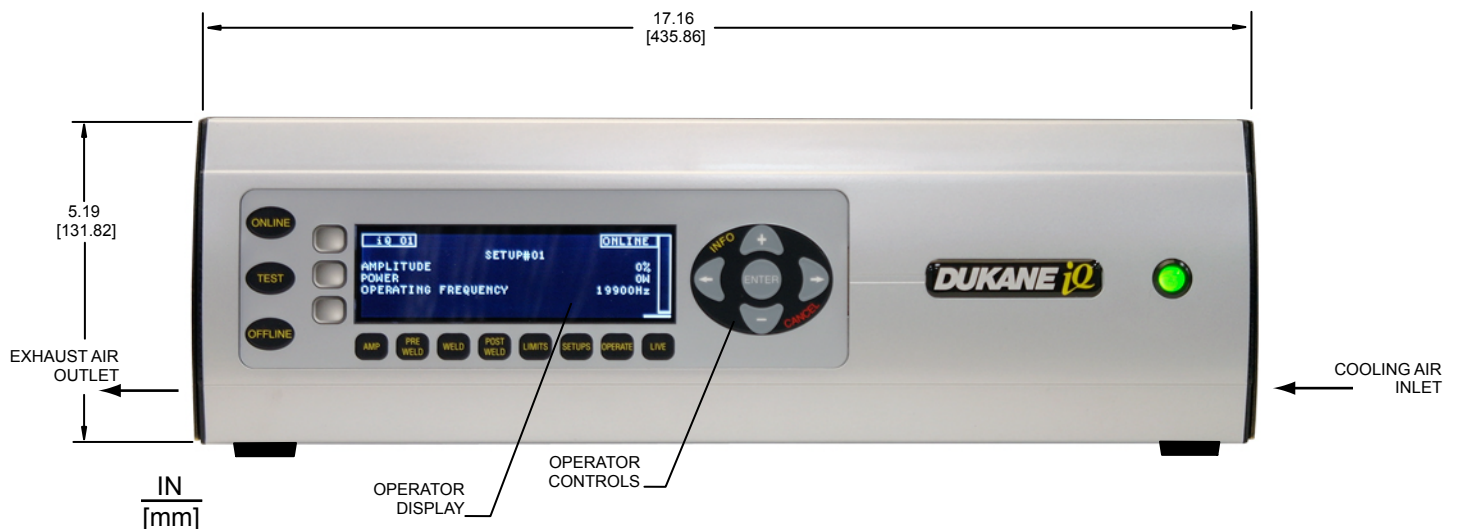


Figure 3-3 Generator - Front View (high profile model)

NOTE

Active Seismic Region Placement - If the generator will be put in an active seismic region, please refer to Application Note 511 at:

http://www.dukane.com/us/DL_AppData.asp

RFI Grounding

In addition to the safety considerations previously mentioned, proper grounding at the generator power cord is essential for the effective suppression of electrical noise or RFI (Radio Frequency Interference). Every ultrasonic generator contains a RFI filter which blocks noise on the AC power line from entering the system control circuitry. This filter also prevents ultrasonic frequency noise from being fed back into the AC power line. In order for the RFI filter to operate properly, it is necessary to correctly ground the system. Run a grounding wire from the grounding stud connection to the nearest grounded metal pipe or equivalent earth ground, and secure it with a ground clamp.

See Figure 3-6 on Page 18.

Proper Handling of Cable Slack

Coil Extra Slack

When taking up slack in cables, the extra length should be coiled up as shown in Figure 3-4 rather than folded as shown in Figure 3-5.

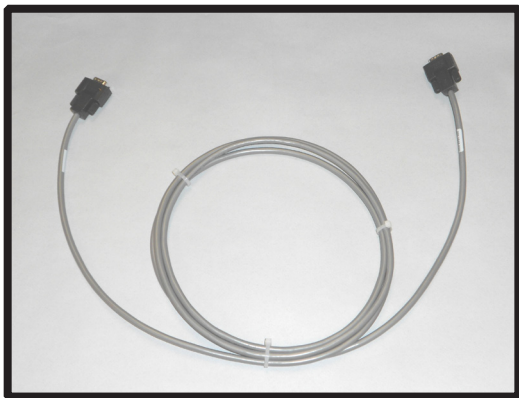


Figure 3-4 Cable Slack Take-up - Correct

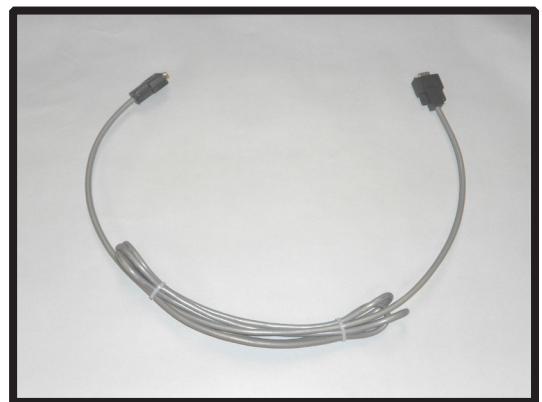


Figure 3-5 Cable Slack Take-up - Incorrect

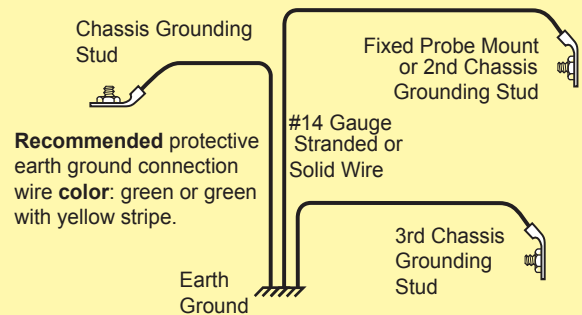
Avoid Excessive Bending

Avoid excessive tension and bends on cables. Cables should be routed so that there are no abrupt bends in the cables, especially near their connectors.

CAUTION



To minimize electrical noise and eliminate ground currents, ground the chassis as shown. Use a STAR configuration (illustrated below). Do not DAISY CHAIN the grounds.



NOTE

Cables shown in the two figures directly above are representative samples. If cables have slack, coil them rather than fold them.

Connecting Cables

(Quick Start Guide)

Details about the various system connectors and their pin assignments are covered in *Section 4*.

Manually Operated Probe System (Hand Probe)

1. Ground the generator chassis using the supplied 14-Gauge wire, and attach it to the grounding stud: **A** in Figure 3-4.
2. Attach the hand probe's HD-15 system input connector to J2 on the I/O panel: **B** in Figure 3-4.
3. Attach high-voltage coaxial cable to J1, the ultrasound output connector: **C** in Figure 3-4.
4. Connect the AC power cord to the IEC power inlet connector on the ultrasonic generator (**D** in Figure 3-4), and plug the other end into an approved AC outlet.

Power Cords

Detached Cords

The AC line cords supplied with the standard generators are matched to the ultrasonic output power rating and the continent of specified use. See Table 3-I.

Continent of Use	Power Cord Part Number	Power
North America	200 - 1110	240V, 15A
	200 - 1541	240V, 10A
Continental Europe	200 - 1111	240V, 16A
	200 - 1542	240V, 10A

Table 3-I Standard IEC AC Power Cord Part Numbers

Attached Cords

100/120 Volt AC Systems - The power cord (including strain relief) supplied with the 100/120VAC systems is permanently attached to the rear of the generator.

240 Volt Systems - High power generators with power ratings above 2400W also use permanently attached power cords.



CAUTION

The power cord is equipped with a three-prong, grounded-type plug for your safety. Whenever a two-slot receptacle is encountered, we strongly recommend that it is replaced with a properly grounded three-lead receptacle.

Have a qualified electrician do the replacement in accordance with the National Electrical Code and local codes and ordinances. **DO NOT** cut off the power cord grounding prong or alter the plug in any way.

NOTE

Refer to **Section 11, Options** for information about optional features.

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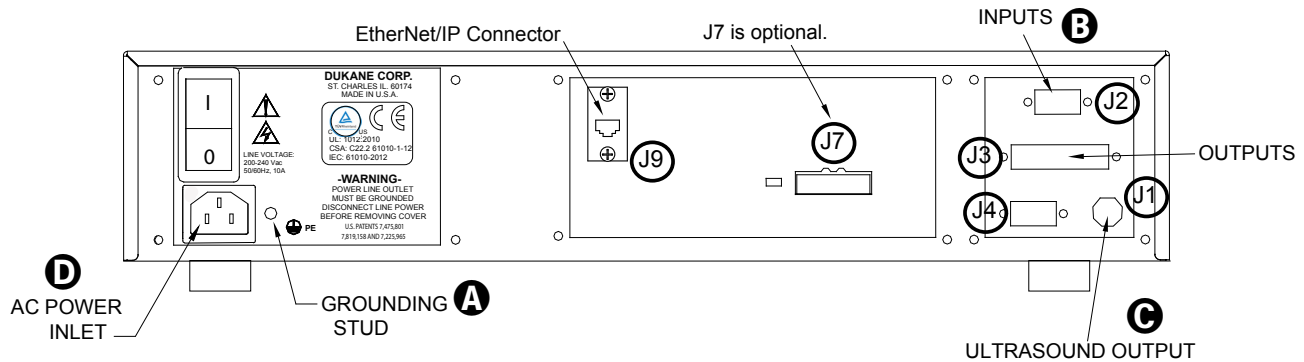


Figure 3-6 Generator - Rear View (low profile model)

Automation Controlled Probe System

1. Ground the generator chassis using the supplied 14-Gauge wire, and attach it to the grounding stud: **A** in Figure 3-6.
2. *Optional – Ground the probe support. This is a user-supplied 14-Gauge wire.*
3. Input Cable - Attach the automation control cable from the user-supplied automation equipment to the system input HD-15 connector, J2 on the I/O panel: **B** in Figure 3-6.
4. Output Cable - Attach an output cable - DB25 type - from J3 to your equipment to monitor system status.
5. Attach the high voltage coaxial cable from the probe to the ultrasound output connector J1: **C** in Figure 3-6.
6. Connect the AC power cord to the generator IEC power inlet connector, and plug the other end into an approved AC outlet: **D** in Figure 3-6.

NOTE

Refer to **Section 11, Options** for information about other features.

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Standard Connections

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Rear Panel Layout Overview

This section provides an overview of the generator rear panel layout, which includes panel areas dedicated to various standard system functions and options that are available. Figure 4-1 illustrates the panel layout.

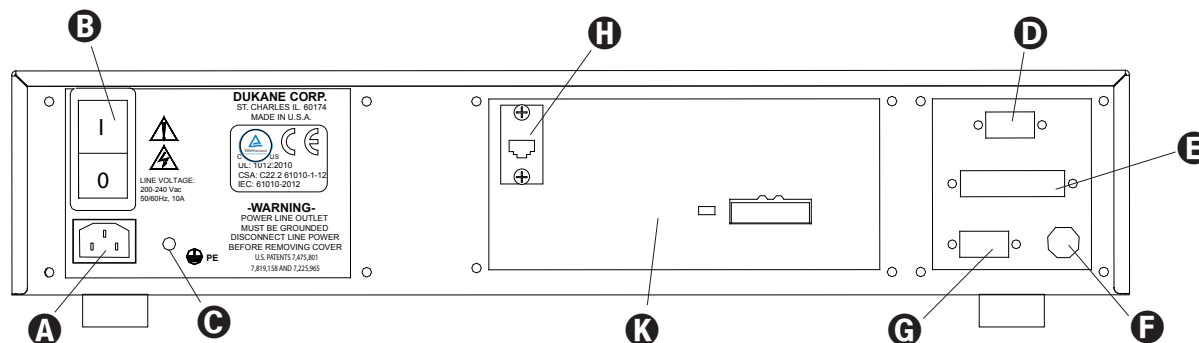


Figure 4-1 Generator Rear Panel

AC Power Inlet Panel

- A** IEC Power Inlet Connector – Attaches to an IEC style power cord.
- B** Power Switch – Circuit Breaker – Used to switch system power ON and OFF.
- C** Chassis Grounding Stud – Chassis connection for a protective earth ground.

The System I/O Panel

- D** System Input Connector – Connections for system control input signals.
- E** System Output Connector – Connections for system status output signals.
- F** Ultrasound Output Connector – Coaxial high voltage connection to ultrasonic stack.
- G** Configuration Port Connector – Digital control port to modify system parameters.

Ethernet/IP Connector

- H** Ethernet/IP Connector – Provides for communication between the *iQ* generator and an automation network.

Options Module Panel

- K** An option module can be installed here.

Figure 4-1 illustrates the options module panel with the optional Remote Control Module installed.

NOTE

See **Section 11, Options** for more information.

AC Power Inlet Panel

The standard AC power inlet panel is described in this section.

IEC AC Power Inlet Connector

The IEC AC power inlet connector mounted on the system AC power inlet panel requires a properly configured IEC compliant power cord, which enables worldwide system operation by simply changing the power cord.

Low profile systems are equipped with a 10 amp rated IEC inlet connector. The high profile systems include a 16/20 amp rated IEC inlet connector. 120VAC and 3600W/4800W systems include a non-detachable power cord.

An appropriately rated power cord must be securely attached to the welding system's IEC inlet connector. If the correct power cord configuration is not included with the system for the local AC power outlet at your location, an appropriate IEC power cord should be available from a local electrical parts supplier. Note that the system under-voltage lockout will inhibit system operation if a North American power cord configured for 120V is connected to the system. A minimum of 200V is required for the system to operate.

Power Switch/Circuit Breaker

The power switch/circuit breaker has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized **I** symbol, the power OFF position is marked with the **0** symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Grounding Stud

The chassis grounding stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in an industrial environment. The chassis ground stud is **ⓐ** in Figure 4-2. Proper system grounding is discussed in *Section 3*.

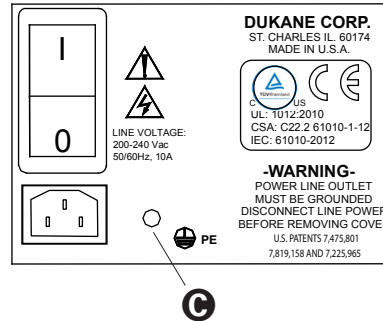


Figure 4-2 IEC AC Power Inlet Connector

System I/O Panel

The standard system I/O panel is described in this section.

System Inputs Connector

The SYSTEM INPUTS connector mounted on the system I/O panel includes connections for all of the basic system control input signals, that will typically come from an automated control system. The cable attached to this connector includes all of the available system control signals, which will be controlled by an output card or output port on the automation controller.

The user can determine which signals to use for each particular welding application, but there must be at least one connection to this connector in order to activate the ultrasound output. All of the input signals on this connector are electrically isolated (signals are NOT referenced to chassis ground) and activated when a 24VDC voltage source is connected to the signal input pin, referenced to the isolated common pin. The electrically isolated input signals can be driven from an automation controller output that is either sinking (NPN) or sourcing (PNP), depending upon how the isolated common connection is terminated. All inputs sink or source 10mA of current from a 24VDC power supply.

Continued

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Note that a simple switch closure (relay contact) connected to a control input can not activate the input without adding an external power supply to power the input. Adding jumper connections to pins available on the System Inputs connector, can configure switch closure inputs to operate referenced to generator chassis ground (non-isolated), without adding a separate power supply, if desired. Refer to *Application Note AN502* found on the Dukane website at:

http://www.dukane.com/us/DL_ApplData.asp

for detailed wiring diagrams of example applications.

The SYSTEM INPUTS connector is a HD-15F (high density D-subminiature 15 circuit female) connector. Connector pin assignments for this connector are shown in Figure 4-4. The male connector on the cable is a mirror image of the panel mounted connector and is shown in Figure 4-5. Table 4-I lists the signal names and descriptions, with more detailed descriptions that follow. The wire color coding for the system input cable is listed in Table 4-I, to assist with custom automation system wiring and assembly.

System Inputs Signal Descriptions

Pin 1 (+22V)

This pin can supply +22VDC at up to 250mA to power the user's automation controls.

Pin 2 (Power Gnd)

Pin 2 is the 22VDC return and is tied to the system chassis ground.

Pin 3 (Remote Setup Selection Bit 0 Input)

Pin 3 is the Remote Setup Selection Bit 0, which is the least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multiple Probe Controller (MPC) Interface option board is installed.

Pin 4 (Remote Setup Selection Bit 1 Input)

Pin 4 is the Remote Setup Selection Bit 1, which is the second least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multiple Probe Controller (MPC) Interface option board is installed.

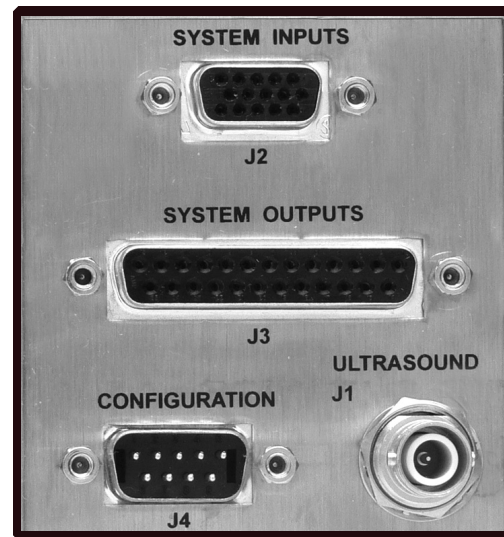


Figure 4-3 System I/O Panel (standard panel shown)

NOTE

Refer to **Section 11, Options** for information on optional features.

Continued

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Pin	Signal Name	Cable Color Code	Signal Option Requirements
1	+22V	BLK	
2	Power Ground	WHT	
3	Remote Setup Selection Bit 0 Input	RED	MPC Option Required
4	Remote Setup Selection Bit 1 Input	GRN	MPC Option Required
5	Remote Setup Selection Bit 2 Input	ORN	MPC Option Required
6	Remote Setup Selection Bit 3 Input	BLU	MPC Option Required
7	Remote Setup Selection Bit 4 Input	WHT/BLK	Not Used
8	Ultrasound Activation/Cycle Start Input	RED/BLK	
9	Automation Thruster Control Input	GRN/BLK	Automation Thruster Board Required
10	Front Panel Control Lock Input	ORN/BLK	
11	Press Inhibit for Hand Probes	BLU/BLK	Hand Probe
12	System Latch Reset Input	BLK/WHT	
13	Isolated Common	RED/WHT	Must be connected to supply positive or ground.
14	Not Used	GRN/WHT	
15	Automation Cycle Stop Input	BLU/WHT	

Table 4-1 System Input Connector Signals (J2)

Pin 5 (Remote Setup Selection Bit 2 Input)

Pin 5 is the Remote Setup Selection Bit 2, which is the third least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multiple Probe Controller (MPC) Interface option board is installed.

Pin 6 (Remote Setup Selection Bit 3 Input)

Pin 6 is the Remote Setup Selection Bit 3, which is the second most significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multiple Probe Controller (MPC) Interface option board is installed.

Pin 7 (Remote Setup Selection Bit 4 Input) (Not used on the basic model generator)

Pin 7 is the Remote Setup Selection Bit 4, which is the most significant bit used to select different welding setups and can only be used with an advanced control system. This bit will not be used when a Multiple Probe Controller (MPC) Interface option board is installed.

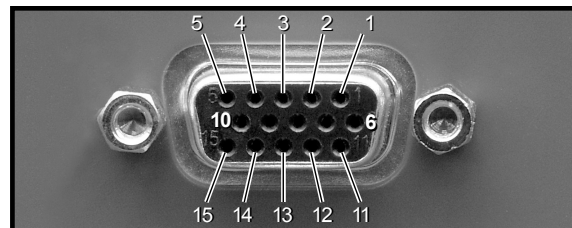


Figure 4-4 HD-15F, Generator Input Connector

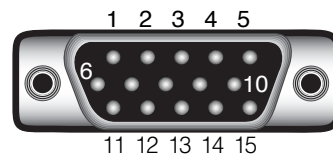


Figure 4-5 HD-15M, Generator Input Cable Connector

Continued

*Continued from Previous Page***Pin 8 (Ultrasound Activation/ Cycle Start Input)**

Pin 8 is used to activate the generator ultrasound output. Activation of this control input will switch the ultrasound output ON, and deactivating this signal will switch ultrasound OFF. This input signal will also function as a cycle start input, where the ultrasound activation and timing are completely under the control of the process controller. Depending on the welding process controller setup, this input signal could be activated momentarily to start a welding cycle. See **Section 6** for more information.

Pin 9 (Automation Thruster Control Input)

Pin 9 is used only when an optional automation thruster control board is installed. (See Page 107.) Activation of this input would cause the thruster attached to the option board to go to the down position. When this signal deactivates, the thruster will move to the up position. This option is typically used for a continuous welding process, when the user wants to retract the ultrasonic stack away from the process (or material) when the ultrasound is off or some changes in the process are being made.

Pin 10 (Front Panel Control Lock Input)

Pin 10 is used to lock the front panel user interface, so an operator cannot change any welding setups or configuration parameters that are stored in memory. The user can use the interface controls to view welding information, but no setup changes are allowed. Deactivation of this signal allows normal operation, without any lockout restrictions.

Pin 11 (Press Inhibit for Hand Probes)

Pin 11 is used to disconnect power applied to a press or thruster, if a hand probe is connected to the system input connector, for safety considerations. The hand probe activation switch could unexpectedly start a welding cycle that activates a press or thruster to the down position. The hand probe cable connector is wired to apply chassis ground to this pin, when it is attached to the system, which activates a press inhibit relay that disconnects power from the pneumatic press valves. This pin must be left open whenever a press control board is installed. Connecting this pin to chassis ground will inhibit press operation.

Pin 12 (System Latch Reset Input)

Pin 12 is used to reset the Any Fault or System Overload status outputs (See Status Output descriptions.). If a fault occurs during a weld cycle, these outputs will normally

remain active until the next weld cycle is initiated. Activating this input will reset the status output faults and may simplify automation programming.

Pin 13 (Isolated Common)

Pin 13 is electrically isolated from chassis ground. Using isolated sourcing (PNP) output drivers, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output. For correct operation of inputs it is critical that this pin is connected to either isolated ground or positive supply.

Pin 14 (Not Used)

Pin 14 is an open connection.

Pin 15 (Automation Cycle Stop Input)

Pin 15 is an input control signal that when enabled, can be used by the automation control system as a redundant signal to shut the ultrasound output off. This signal could also be reconfigured through menu selections to function as an automation end-of-weld control signal input.

System Outputs Connector

The SYSTEM OUTPUTS connector mounted on the generator I/O panel includes connections for all of the basic system status and monitor output signals, which will typically connect to an automated control system. The cable attached to this connector includes all of the available system output signals, which will be read or monitored by a digital input card or analog inputs on the user-supplied automation controller.

The user can determine which signals are appropriate for each welding application.

The system monitor output signals are analog signals used to monitor ultrasonic amplitude setting and ultrasonic output power levels, referenced to the Monitor Common (Pin 13). This is at system chassis ground potential (non-isolated). All of the digital output status signals on this connector, are isolated PHOTOMOS relays (signals are not referenced to generator chassis ground). When an output is active, these relays are closed (the output is connected to Isolated Common) when active. This configuration supports PNP and NPN automation inputs, depending on how the common is terminated.

System Outputs Connector Pinout

The SYSTEM OUTPUTS connector is a DB-25F (standard D-subminiature 25 circuit female) connector. Connector pin assignments for this connector are shown in Figure 4–6. The male connector on the cable is a mirror image of the panel mounted connector and is shown in Figure 4–7. Table 4–II lists the signal names. Detailed descriptions are listed in the System Outputs Signal Descriptions section below. To assist with custom automation system wiring and assembly, the wire color coding for the system outputs cable is listed in Table 4–II.

System Outputs Signal Descriptions

Pin 1 (+22V Power Supply)

This pin can supply +22VDC at up to 250mA to power the user's automation controls.

Pin 2 (Not Used)

Pin 2 is an open connection.

Pin 3 (+22V Power Ground)

Pin 3 is the 22VDC return and is tied to the system chassis ground.

Pin 4 (Programmable Status Output 1)

Pin 4 is a digital output that can be reprogrammed and assigned to another system status signal (from the available selections) using the front panel controller.

Pin 5 (Programmable Status Output 2)

Pin 5 is a digital output that can be reprogrammed and assigned to another system status signal (from the available selections) using the front panel controller.

Pin 6 (Ultrasound Active Status Output)

Pin 6 is a digital output that activates when the system is delivering ultrasonic power to the load attached to the ultrasound output connector. This output will be an open circuit when the ultrasound output is off.

Pin 7 (Any Fault Status Output)

Pin 7 is a digital output that activates whenever any fault condition is detected that inhibits ultrasound output and normal system operation. This output will be an open circuit when no system fault conditions are detected. Any Fault output remains active until cleared by the System Latch Reset input or by the start of the next weld cycle. Generator faults that will activate the Any Fault output:

- Overload (Average, Peak, Frequency)
- Over Temperature Fault
- System Power Fault
- Current Loop Fault

Pin 8 (Press Trigger Status Output)

NOT AVAILABLE.

Pin 9 (System Overload Status Output)

Pin 9 is a digital output that activates whenever any overload condition is tripped. Activation of the overload status output signal could be caused by an Average, Peak or Frequency overload condition. After the overload status output activates, it will remain active until cleared by the System Latch Reset input or by the start of the next weld cycle. This output will be an open circuit when no overload conditions have been detected.

Pin 10 (System On-Line Status Output)

Pin 10 is a digital output that activates when the system is in the ONLINE operating mode, which enables the activation of the ultrasonic output. This output will be an open circuit if the system is switched to the OFFLINE operating mode, or if an externally connected E-STOP has been activated, and the open circuit prevents the start of a welding cycle or activation of the ultrasound output. Note that an automation controlled process can not weld any parts, if the system is, accidentally or otherwise, switched to the OFFLINE operating mode.

Pin 11 (Press Top of Stroke Status Output)

NOT AVAILABLE.

Pin 12 (Current Loop OK Status Output)

This status output signal will activate only when a Remote Amplitude Control Board is installed in the system. Pin 12 is a digital status output that activates when the current loop input to the remote control option board is connected and working normally. This output will be an open circuit when the current loop input signal is too low for proper system operation (less than 2mA). This may be due to a broken wire connection, a failed current loop controller or the current loop input wired incorrectly to the input terminal block.

Continued

*Continued from Previous Page***Pin 13 (Analog Monitor Signal Common)**

Pin 13 is the signal common (ground) connection for all of the analog monitor signals (on Pins 14, 15 and 16). This signal common pin is connected to system chassis ground and is not isolated from the generator chassis. This is an analog signal ground connection. Do not connect anything to this ground connection, except the wiring to the inputs of the analog instrumentation devices used to measure the monitor output signals.

Pin 14 (Not Used)

Pin 14 is connected to the system chassis ground.

Pin 15 (Power Signal Monitor Output)

Pin 15 is an analog output signal used to monitor the power output from the welding system. The scaling on this output signal is as shown below:

15kHz, 20kHz, 30kHz and 40kHz systems:

1 Watt = 0.001 VDC (1mV per Watt)

Example: • 20kHz system measures 0.525 VDC on Power Monitor Output = 525 Watts.

Pin 16 (Amplitude Monitor Output)

Pin 16 is an analog output signal used to monitor the system amplitude setting. The scaling on this output signal is 100% amplitude = 10.0 VDC, or 0.1 VDC per 1% amplitude. This monitor signal output would typically be used when a remote control option board is installed in the system. The automation control system will adjust the system's amplitude setting remotely, using a 4-20mA current loop attached to the input of the remote control board. Using this monitor output, the control system can verify that the amplitude is set to the expected programmed amplitude level.

Pin 17 (Amplitude Regulation Status Output)

This signal will be activated at the end of the ramp-up time until the beginning of the ramp-down time. This status signal will be active for the time the ultrasound is at the programmed amplitude setting.

Pin 17 is a digital status output that activates when the system is regulating the amplitude correctly. This output becomes an open circuit when the system falls out of regulation. When that happens, it cannot adjust the system output to the output level that was programmed as the regulation set point.

Pin 18 (MPC Ready Status Output)

This status output signal will activate only when an MPC interface board is installed in the generator. Pin 18 is a digital status output that activates when the MPC controller is ready to accept changes on the probe selection control bits and ready to start the next MPC welding cycle. This output will be an open circuit when the MPC system is not ready to accept changes to control input signals.

Any changes will be ignored until this status output signal activates to the ready state. This status output signal will also be open (MPC NOT READY) if a fault condition is detected inside the MPC system. If this status output will not activate, check for a red fault status indication, the SYSTEM STATUS LED, on the front of the MPC module.

Pin 19 (System Power OK Status Output)

Pin 19 is a digital status output that activates when no fault conditions are detected by any of the power fault detection circuits included in the system. This output will be an open circuit when any power related fault is detected in the system.

Pin 20 (Bad Part Status Output)

Pin 20 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed bad part limits. This output will be an open circuit when a bad part has not been detected.

Pin 21 (Good Part Status Output)

Pin 21 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle do not exceed the programmed suspect or bad part limits. This output will be an open circuit after a welding cycle when either a suspect or bad part has been detected.

Continued

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Pin 22 (System Ready Status Output)

This status output signal will activate only when the system is ready to activate ultrasound or begin a weld cycle. Pin 22 is a digital status output that activates when a weld processing cycle is completed and the welding process control system is ready to start the next welding cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This includes system faults or offline active, but not a process fault like Overload.

Pin 23 (Suspect Part Status Output)

Pin 23 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed suspect part limits. This output will be an open circuit after a welding cycle when a suspect part has not been detected.

Pin 24 (Isolated Common)

Pin 24 is electrically isolated from chassis ground.

Pin 25 (Not Used)

Pin 25 is an open connection.

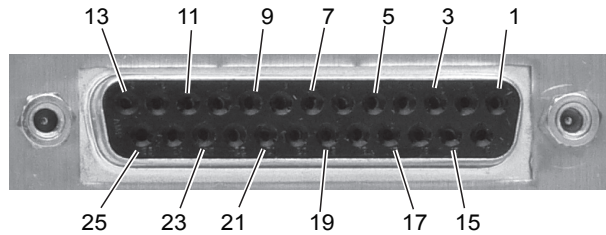


Figure 4-6 DB-25F, Generator Output Connector (J3)

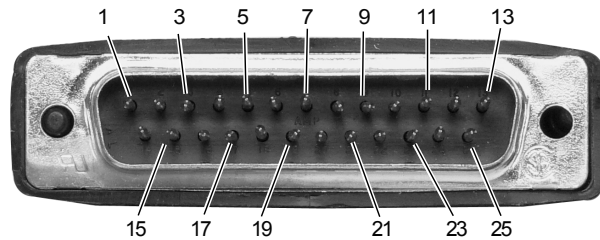


Figure 4-7 DB-25M, Generator Output Cable Connector

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Pin	Signal Name	Cable Color Code	Signal Option Requirements
1	+22V	BLK	
2	Spare Output	WHT	
3	+22V Power Ground	RED	
4	Programmable Status Output 1	GRN	
5	Programmable Status Output 2	ORN	
6	Ultrasound Active Status Output	BLU	
7	Any Fault Status Output	WHT/BLK	
8	Press Trigger Status Output	RED/BLK	Not Available
9	System Overload Status Output	GRN/BLK	
10	System Online Status Output	ORN/BLK	
11	Press Top of Stroke Status Output	BLU/BLK	Not Available
12	Current Loop OK Status Output	BLK/WHT	Remote Control Option Board
13	Analog Monitor Signal Common	RED/WHT	
14	Not Used	GRN/WHT	
15	Power Signal Monitor Output	BLU/WHT	
16	Amplitude Monitor Output	BLK/RED	
17	Amplitude Regulation Status Output	WHT/RED	
18	MPC Ready Status Outputs	ORN/RED	MPC Option Board
19	System Power OK Status Output	BLU/RED	
20	Bad Part Status Output	RED/GRN	
21	Good Part Status Output	ORN/GRN	
22	System Ready Status Output	BLK/WHT/RED	
23	Suspect Part Status Output	WHT/BLK/RED	
24	Isolated Common	RED/BLK/WHT	
25	Not Used	GRN/BLK/WHT	

Table 4-II System Output Connector Signals (J3)

Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.



Figure 4-8 Ultrasound Output Connector

CAUTION



The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels this can exceed 2 amperes of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

Do not use your generator if there is any evidence of arcing (black carbon deposits) on either the ultrasound output connector or the ultrasound cable connectors.

Configuration Port Connector

The configuration port connector is a DB-9M (standard D-subminiature nine circuit, male) typically used for RS-232 serial communications. This serial port (DTE) connects to a serial port (DCE) on a computer via a standard 9-pin serial cable. If the computer does not have a serial port, you may use a USB-to-serial conversion cable.

This port is used for field updates to the generator firmware, without removing the enclosure cover. This port can also be used to configure and monitor the generator settings and status via *iQLinQ* over RS232 or with an external Profibus to *iQLinQ* converter box.

EtherNet/IP Port Connector

The EtherNet/IP connector allows the *iQ* generator to connect to an EtherNet/IP network.

Control Parameters Available via EtherNet/IP (Time [only] option)

1. Set these parameters: Weld Time, Amplitude, Ramp Up Time, and Ramp Down Time.
2. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency Limits.

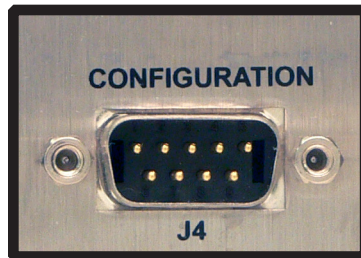


Figure 4-9 Configuration Port Connector



Figure 4-10 Ethernet/IP Port Connector

Continued

Parameters Available via Ethernet/IP

(Time and Energy Option)

1. All parameters that are configured via EtherNet/IP.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld which includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy
 - Peak Power
 - Faults

For information on how to control and/or monitor specific parameters, *iQ* Generator EtherNet/IP Communication and Control documentation is available. Contact your local sales representative for more information.

SECTION 5

Standard System Status and Controls

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Front Panel Controls

This section introduces the *iQ* Series ultrasonic generator LS-E control panel and LCD display with this information:

- Functions of the panel components shown in Figure 5-1 below are discussed.
- These screen basics are introduced:
 - Making selections,
 - Interpreting on-screen arrows,
 - Taking a look at setup identification.

NOTE

Do not touch the display.

Touch only the keys that are on the front panel.

Cleaning - If the display is dirty, clean it by first putting a mild cleaning solution on a clean, soft cloth. Then, gently wipe the cloth over the screen.

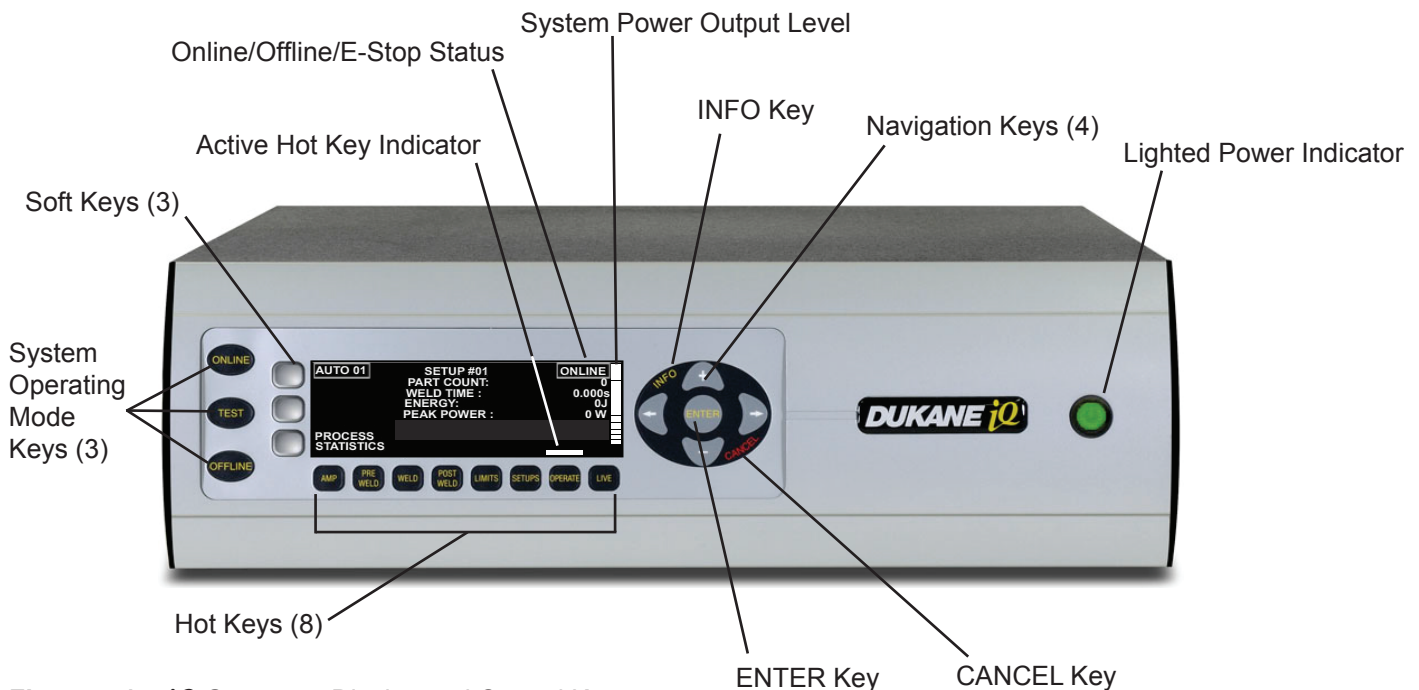


Figure 5-1 *iQ* Generator Display and Control Keys

System Operating Mode Keys

ON LINE - After AC power has been activated and the generator is operating normally, ON LINE is the normal operating mode. The generator can produce ultrasound signals in this mode.

The word, **Online** appears in a white outlined box in the upper right of the display. See Figure 5-2.

TEST - After AC power has been activated and the generator is operating normally, in the ON LINE mode, the TEST key can be pushed.

This activates a momentary ultrasound pulse allowing the operator to test system function. The display will show the real time settings for **Amplitude**, **Power**, and **Operating Frequency**. This information is useful in troubleshooting.

While pushing the TEST key, look at the System Power Output Level bar graph. See Figure 5-3. There should be at least one segment lit.

IMPORTANT - If more than three segments are lit, with no load applied to the ultrasonic stack, make sure the stack is properly assembled and not damaged. During normal operation, the peak level LED segment remains lit (approximately 1 second) until the next cycle begins.

OFFLINE - After AC power has been activated and the generator is operating normally, the OFFLINE key may be pressed to put the generator into the offline mode. In this mode the generator can not generate an ultrasound signal.

The word, **Offline** appears in a white outlined box in the display's upper right corner.

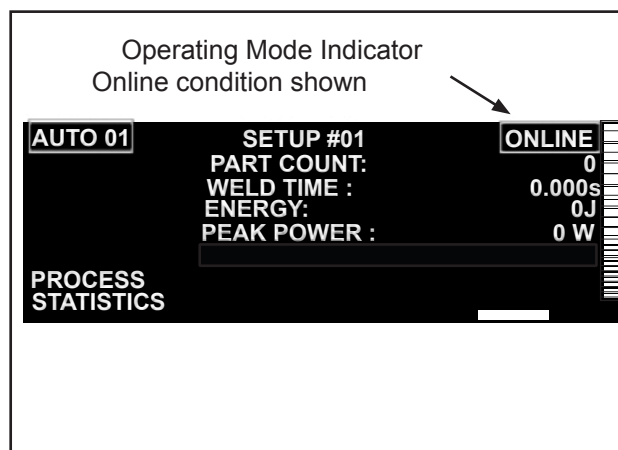


Figure 5-2 Display Detail, Operating Mode Indicator

CAUTION

If a transducer is not connected to the ultrasound output connector, the system should be set to the OFFLINE mode.

Do not activate the ultrasound output without a transducer connected. Make sure that the stack is properly assembled before it is connected to the system. The horn should never come in direct contact with a metal fixture or anvil with ultrasound activated.

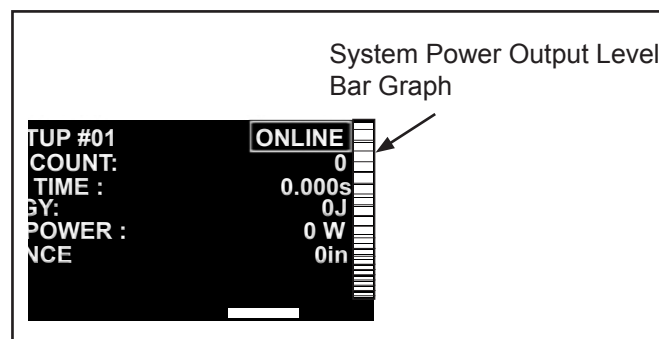


Figure 5-3 Display Detail, Power Output Level

Navigation Keys (4)

Moving the Cursor - Press the **left and right navigation** (← →) keys to move the display's cursor left or right respectively.

Press the **up and down navigation keys** (+ or -) to scroll through menu lists. Also, use the ← → keys to move to a digit and change the value of a selected digit with the + or - keys.

ENTER Key

Press ENTER to confirm and store a selection in memory.

Example: After entering a time value, press ENTER.

CANCEL Key

Press the CANCEL key to stop editing a value without saving changes to the value or to leave secondary menu screens.

INFO Key

Press the INFO key, and the menu shown to the right in Figure 5-5 appears.

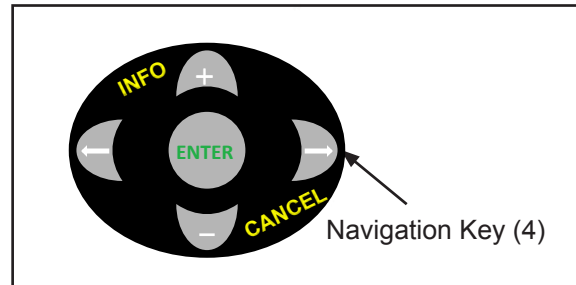


Figure 5-4 Navigation Keys (4), with Enter, Info and Cancel

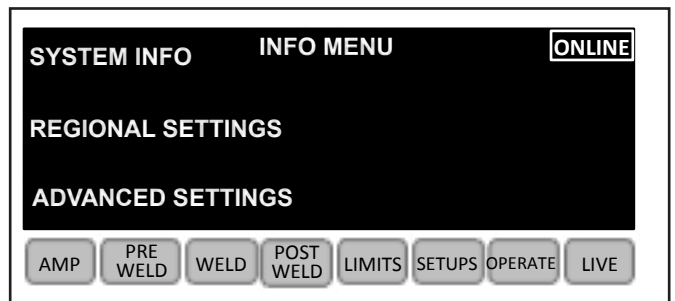


Figure 5-5 Info Menu Display

NOTE

For more information about the INFO menus, please see **Section 6 - Operation**.

Soft Keys Bordering the Display (3)

Use the three keys bordering the left side of the display to make selections from the choices shown on the display.

Not all keys will be active on any given screen.

Example: For the display shown in Figure 5-6 below, two of the three soft keys are active:

Weld, and **Afterburst**.

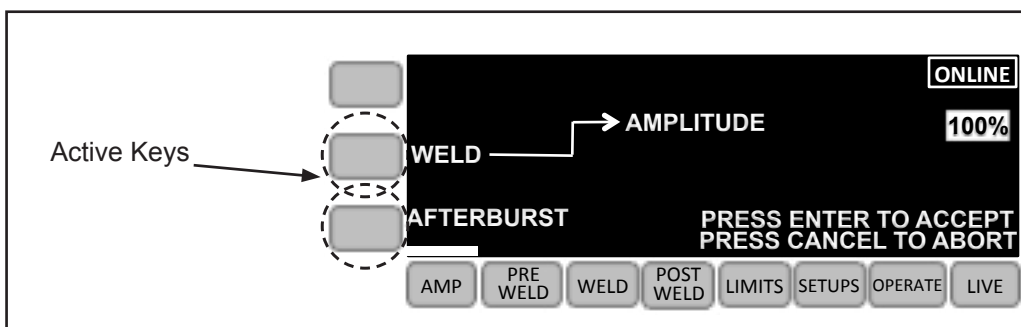


Figure 5-6 Active Soft Keys, Example

Continued

Hot Keys (8)

Each of the eight hot keys under the display, when pressed, brings up one of these portions of the generator menu:

- **AMP** - Adjust amplitude for Start, Weld, and Afterburst portions of the weld cycle.
- **PRE-WELD** - Select operating Mode; Trigger type, and trigger maximum time.
- **WELD** - Choose weld type (time, energy, or peak power).
- **POST WELD** - Set parameters for Hold and Afterburst parts of the cycle.
- **LIMITS** - Set which weld characteristics to be displayed, and which will have their bad part or suspect part limits enabled.
- **SETUPS** - Choose setup control, name setups, copy and erase setups.
- **OPERATE** - This is a display-only screen showing cycle data from the last cycle. Only those selected to be displayed or have process limits set will be shown.
- **LIVE** - This is a display-only screen showing real time Amplitude, Power, and Operating Frequency.

See **Section 6 - Operation**, for more detail on the functions of these hot key sub-menus.

NOTE

Available selections are dependent on equipment model.

NOTE

The white bar along the bottom of the LCD display indicates what Hot Key menu is being displayed.

System Power Output Level (Bar Graph)

A bar graph displays the percentage of ultrasonic power being drawn by the load. See Figure 5-7 to the right.

Bar Graph Power Scaling

Power scaling is related to amplitude. At 100% amplitude the whole graph is lit, and the generator is operating at 100% power. At 50% amplitude the entire graph is lit, and the generator is operating at 50% power.

If the amplitude setting is lowered, the graph rescales automatically according to the revised amplitude.

Example: With a 1200W generator, at 50% amplitude, if the whole graph is lit, that represents 600W.

Lighted Power Indicator

This front panel lighted power indicator glows after the rear panel AC power switch/circuit breaker is turned ON:

On start-up, the light flashes RED for a few seconds, and then turns steady GREEN. This indicates AC power has activated the generator.

When the AC power switch is turned to the OFF position, the front panel lighted power indicator goes out. This indicates the generator no longer has power.

If a power fault occurs, the LED turns RED.

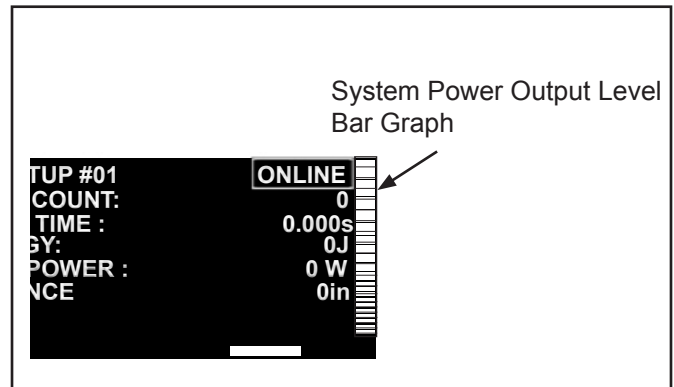


Figure 5-7 Display Detail, Power Output Level



CAUTION

If an alarm indicates there is an overload fault, verify that the ultrasonic stack is not damaged.

NOTE

Go to **Section 6 - Operation, Start-up Sequence** for an explanation of the generator start-up sequence.

Screen Basics

Making Selections

Figure 5-8 below shows there are several ways to show that an item has been selected:

- An area of white highlights a selected item.
- The cursor shows what digit is selected.

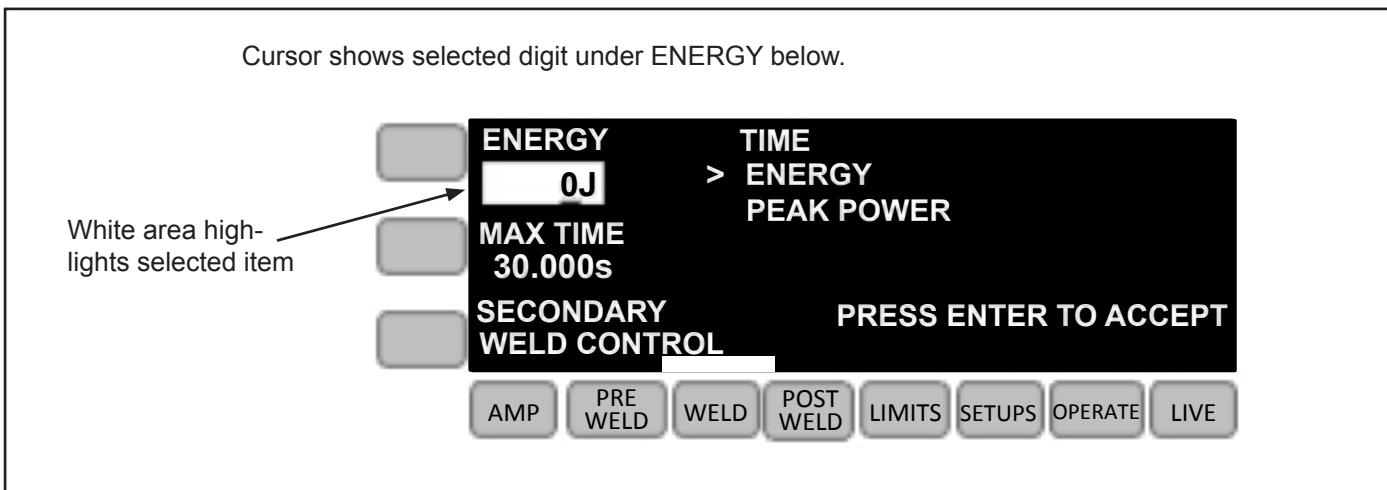


Figure 5-8 Making Selections

Interpreting

On-screen Arrows

Arrows pointing up and down, give visual cues that more text is available in the direction the arrow points. An example is shown below in Figure 5-9. For this screen, the + and - (up or down) navigation keys are used to move in the direction of the on-screen arrow.

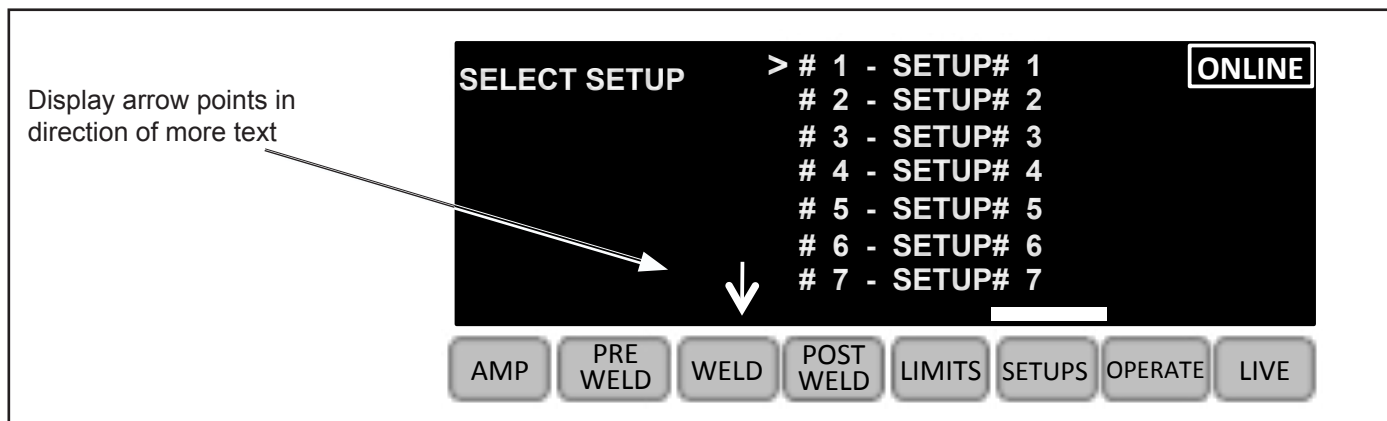


Figure 5-9 Arrows Indicate Direction of More Text

Continued

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Setup Identification

Setup identification can be seen at the top of the screen as shown in the figure below.

The example shown in Figure 5-10 illustrates that setup control is by automation (Auto 01).

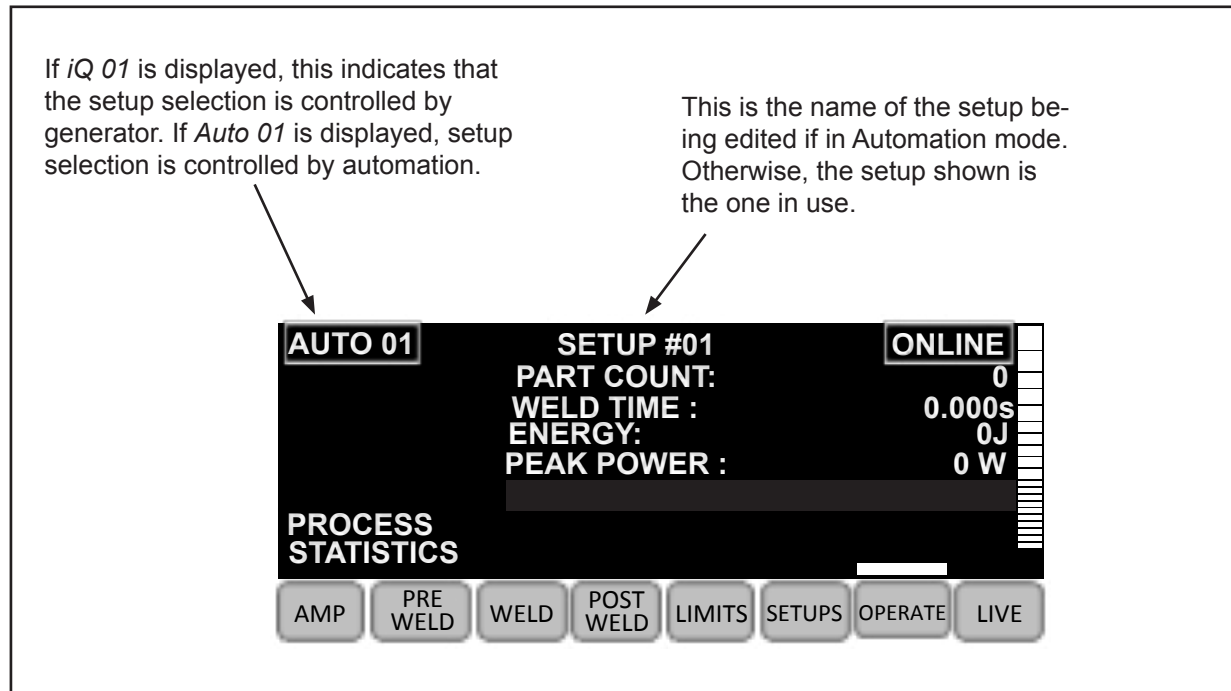


Figure 5-10 Main Menu Detail - Setup Identification

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SECTION 6

Operation

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Overview

The **iQ Series** generator, model LS-E, is typically part of a system. Major components of the system would be:

- **iQ** generator,
- Probe and horn, or hand probe and horn, or
- Customer supplied automation equipment including probe and horn.

The user controls nearly all aspects of the welding process through the front panel of the **iQ** LS-E generator.

NOTE

The acoustic stack, and tooling will require their own individual adjustments as those components are integrated into your particular system.

Helpful information on a wide variety of assembly equipment, processes and techniques can be found at the Dukane website:

http://www.dukane.com/us/PPL_upa.htm

Continued

Start-up Sequence

After all connections have been completed,

1. Push the rear panel AC breaker switch to ON.

The generator begins its self-diagnostics sequence.



2. The lighted power indicator flashes RED for several seconds.

See Figure 6-1.

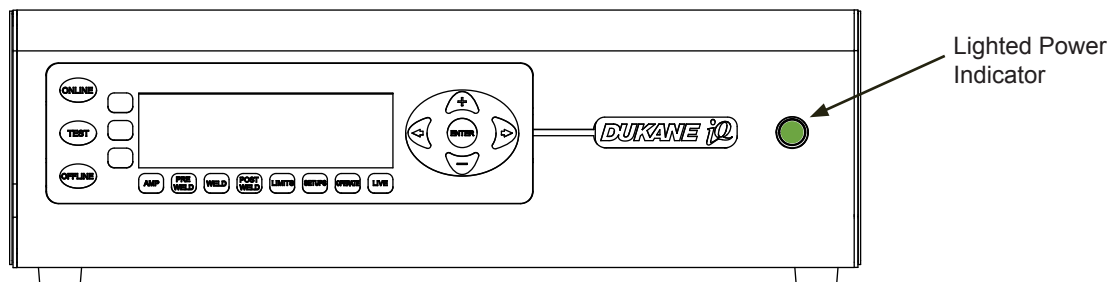


Figure 6-1 Front Panel with Power LED

3. First, a short beep is given. Then the image on the screen identifies the Dukane generator. (This is the same information that displays when INFO is pressed.) See Figure 6-2.

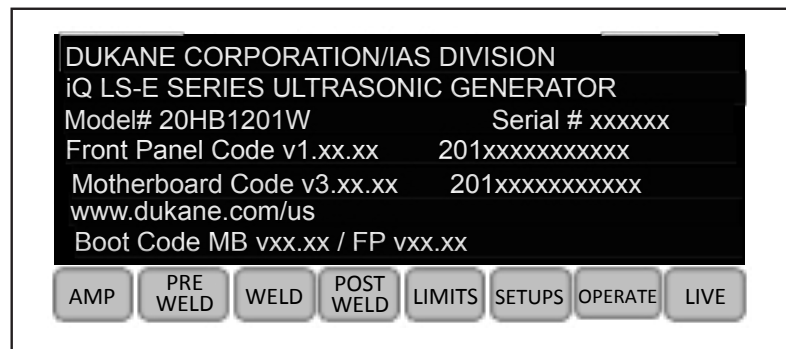


Figure 6-2 Start-up Sequence 1 - INFO Screen

NOTE

A welding cycle cannot be started when the mode is OFFLINE because the ultrasound output signal is disabled.

Continued

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4. The start-up sequence is finished when the power LED turns a steady GREEN and the OPERATE screen is displayed.

See Figure 6-3.

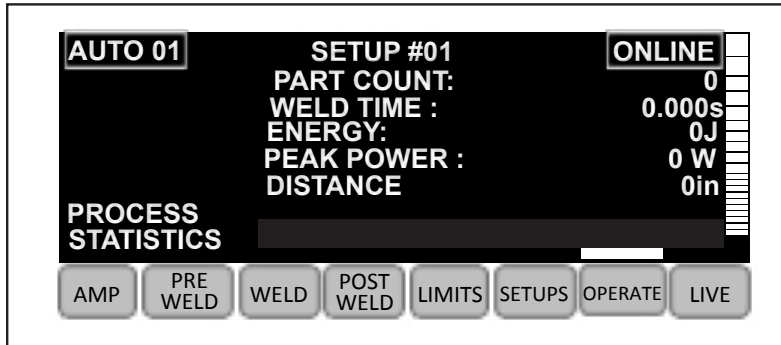


Figure 6-3 Start-up Sequence 2 - OPERATE Screen (typical)

Stopping the Weld Cycle

Normal Conditions

The cycle stops when the programmed welding cycle ends or the U/S Activate input is deactivated depending on the MODE setting.

Emergency Conditions

Manual System

Press OFFLINE to stop the ultrasound signal. This may be done under any condition.

Automated System

Customer-supplied external controls provide the means to stop the cycle for an automated system.

An auxiliary cable connects these external controls to the iQ generator at connector J2.

Control input labeled, “Automation Cycle Stop Input” (Pin 15) when activated will stop the weld cycle if configured as “End of Weld”.

Using the Menus

The figure below provides an overview for the menu structure and a beginning page number reference for the item. The user can access the menus through the generator's eight hot keys and through the INFO key.

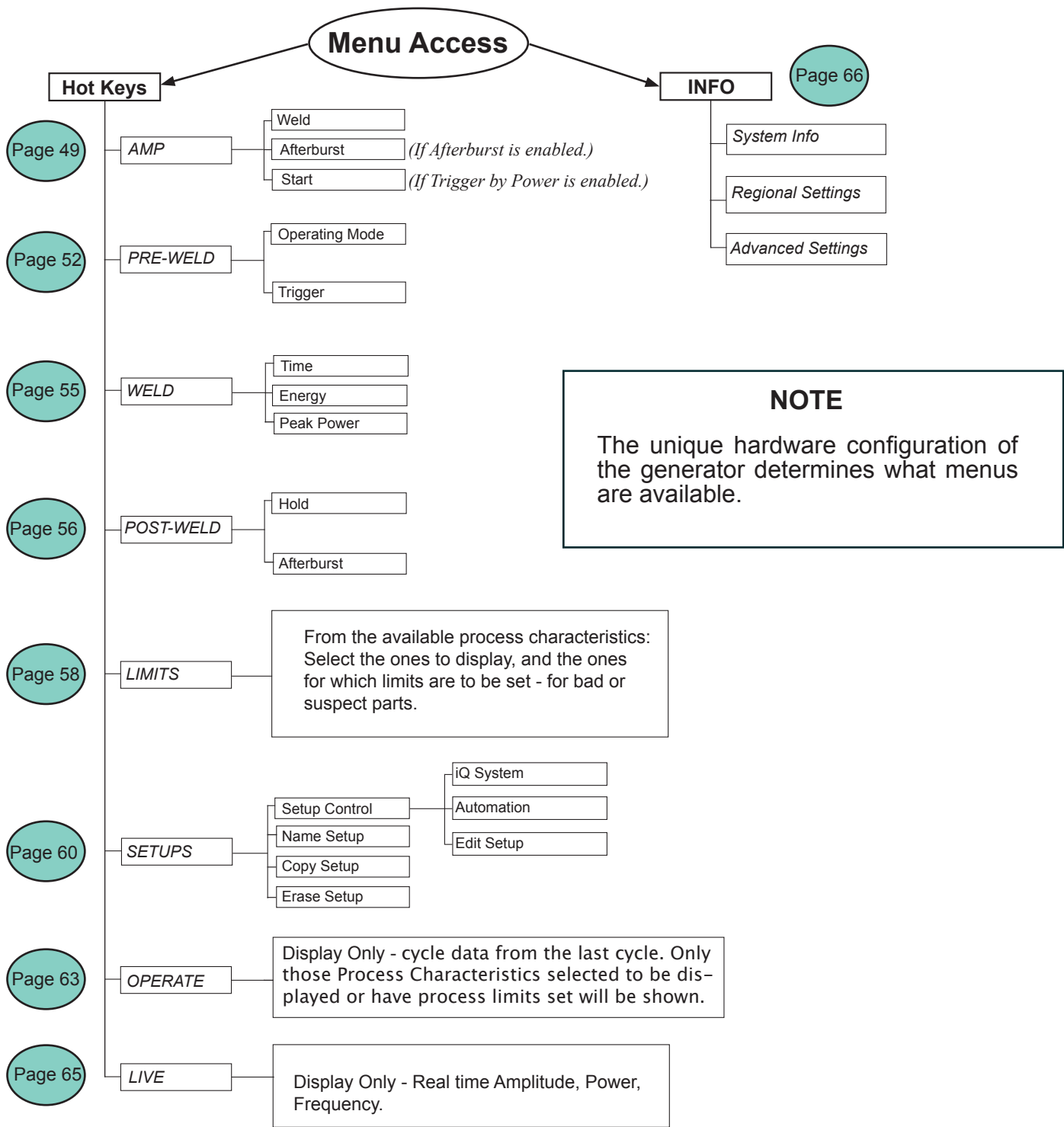


Figure 6-4 Generator Menu Overview

Continued

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NOTE

For all menus - When a button is pressed to access the menu, the last accessed parameter will be selected and ready to change if applicable.

Example: If the PRE WELD button is pressed, and the MODE was the setting last accessed in that menu, then MODE is selected and ready to change.

NOTE

On screen Prompts - Watch for and follow on screen prompts where they appear.

Example: In Figure 6-5 below the prompts are:

PRESS ENTER TO ACCEPT, or PRESS CANCEL TO ABORT

AMP

The menu in Figure 6-5 is the default display showing WELD with its amplitude value ready to be changed.

This is the only amplitude menu available if MODE is set to AUTOMATED PROBE.

If iQ CONTROLLED PROBE MODE is selected, and AFTERBURST is enabled in the POST WELD menu, then the AFTERBURST soft key is also displayed as shown in Figure 6-6 to the right. The parameter value last accessed will be selected and ready to change.

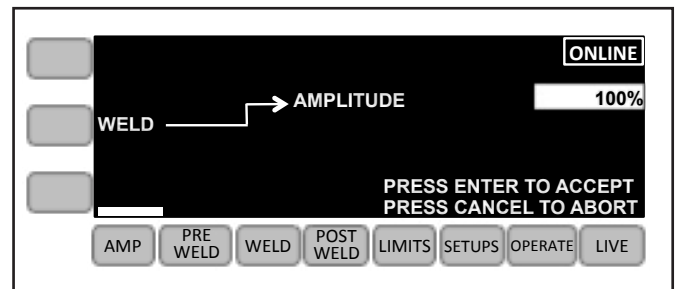


Figure 6-5 Setting Weld Amplitude

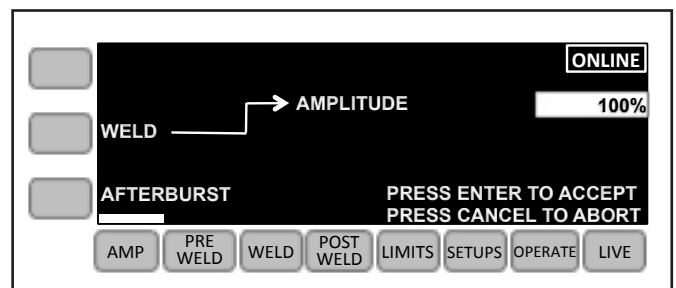


Figure 6-6 Setting Weld Amplitude with Afterburst Enabled

Continued

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Pressing the AMP button when TRIGGER BY POWER is enabled (see NOTE to the right), brings up the screen shown to the right. This menu has START as the top soft key. The setting last accessed is selected and ready to be changed. In the example shown in Figure 6-7, that is START > AMPLITUDE.

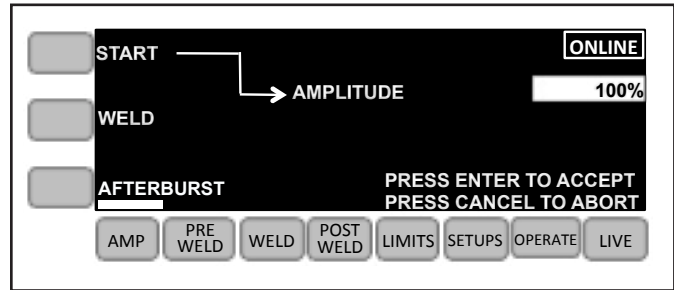


Figure 6-7 Setting Weld Amplitude with Trigger By Power Enabled

NOTE

Amplitude Range = 20-100%

NOTE

To enable Trigger by Power:

1. PREWELD button is pressed.
2. Mode is iQ Controlled Probe.
3. TRIGGER soft key has been pressed, Press ENTER.
4. Select POWER, and press ENTER.
5. Select POWER parameters (AMPLITUDE, POWER, and MAX TIME)

Continued

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Remote Amplitude Board

If a remote amplitude board is detected, the choices shown in Figures 6-8, 6-9 and 6-10 to the right are displayed.

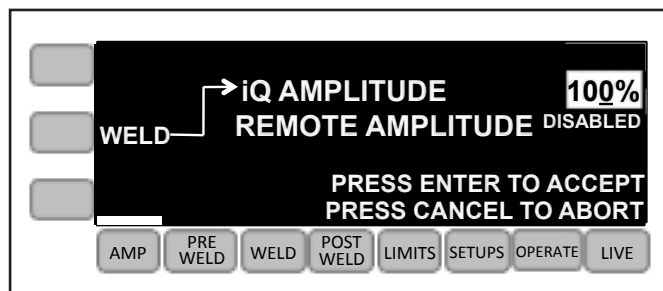


Figure 6-8 Setting Weld Amplitude with Remote Amplitude Board

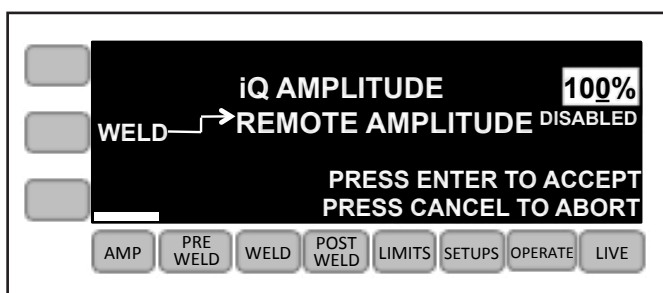


Figure 6-9 Setting Weld Amplitude with Remote Amplitude Board Disabled

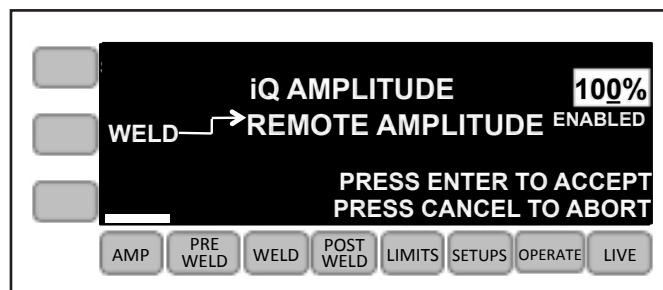


Figure 6-10 Setting Weld Amplitude with Remote Amplitude Board Enabled

PRE-WELD

The PRE WELD menu is shown in Figure 6-11. The selected mode is highlighted (AUTOMATED PROBE). To change to a different mode, move arrow to desired mode, and press ENTER. The PROBE DELAY soft key is available in this mode.

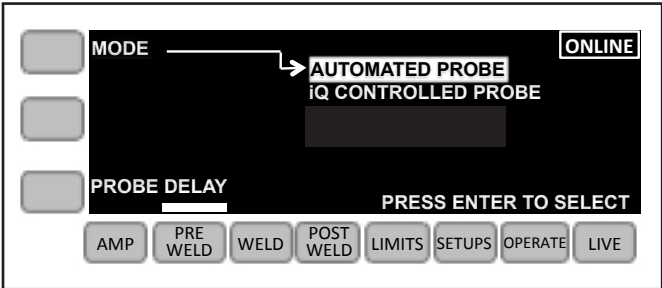


Figure 6-11 Pre Weld Menu, Mode: Automated Probe

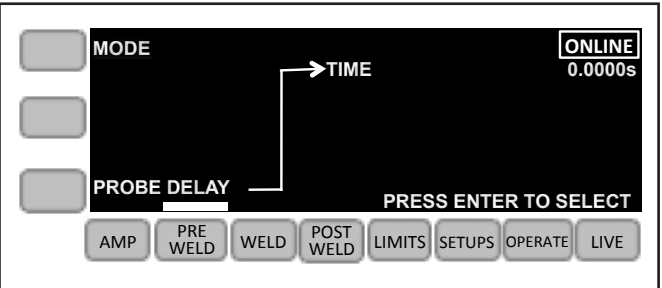


Figure 6-12 Pre Weld Menu, Probe Delay

PROBE DELAY menu is shown in Figure 6-12 at right.

NOTE

PROBE DELAY is only available in AUTOMATED PROBE MODE.

Continued

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The PRE WELD menu shown in Figure 6-13 has the selected mode highlighted (iQ CONTROLLED PROBE). To change to a different mode, move arrow to desired mode, and press ENTER.

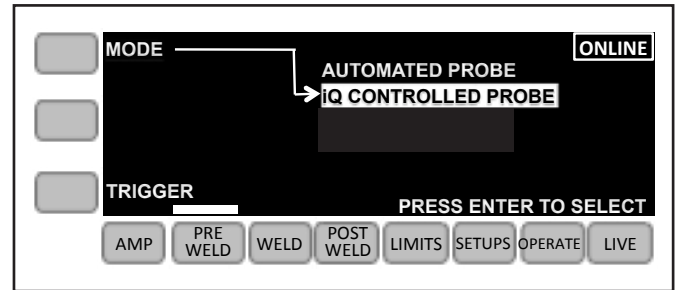


Figure 6-13 Pre Weld Menu, Mode: iQ Controlled Probe

The TRIGGER menu is shown in Figure 6-14.

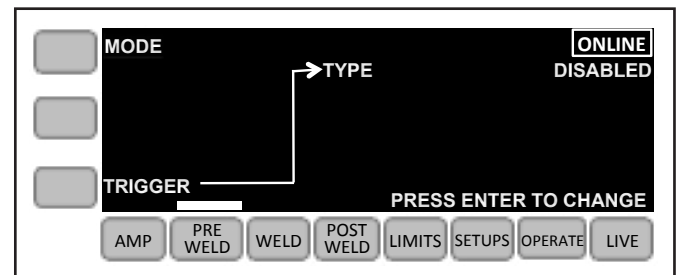


Figure 6-14 Pre Weld Menu, Trigger Menu

Making the selection of trigger type is shown in Figure 6-15.

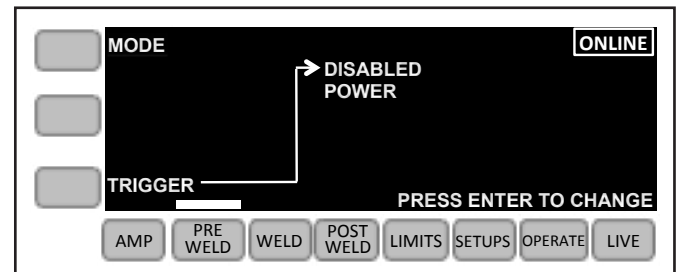


Figure 6-15 Pre Weld Menu, Trigger Selection

TRIGGER BY POWER has been chosen as the trigger type as shown in Figure 6-16.

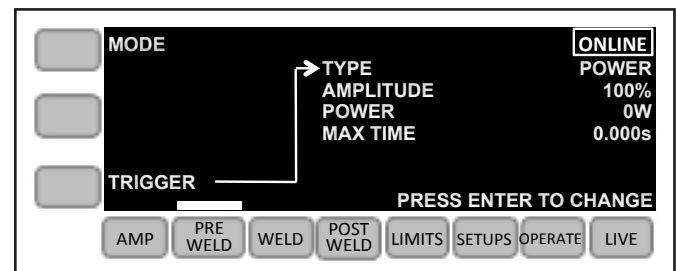


Figure 6-16 Pre Weld Menu, Trigger By Power Selected

Continued

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MPC Module Installed

If a MPC module is detected, the choices shown in Figure 6-17 to the right are displayed.

When a hand probe is connected to the generator, the screen will appear as in Figure 6-18 to the right.

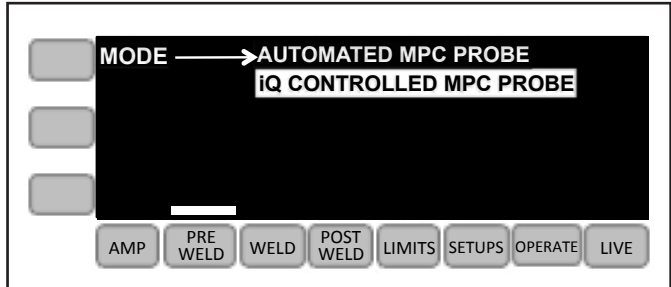


Figure 6-17 Pre Weld Menu, MPC Module Installed

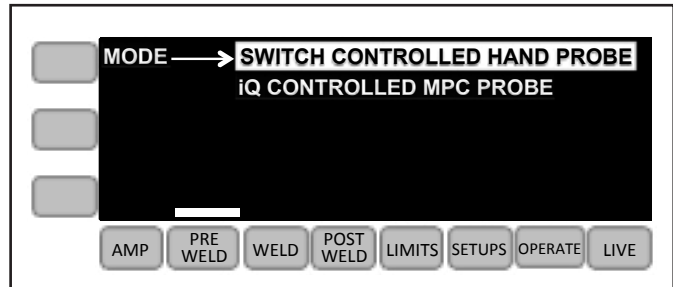


Figure 6-18 Pre Weld Menu, Hand Probe Connected

WELD

The WELD menu seen in Figure 6-19, shows the message that is displayed if the MODE was set to **AUTOMATED PROBE**.

The WELD menu shown in Figure 6-20 has the MODE set to **iQ CONTROLLED PROBE**. This probe generator supports time only.

The WELD menu shown in Figure 6-21 has the MODE set to **iQ CONTROLLED PROBE**. This probe generator supports time and energy.

This is the only choice that has a **SECONDARY WELD CONTROL** soft key. Because energy is the primary weld method, **ENERGY** is not a possible choice as the secondary choice.

The menu shown in Figure 6-22 at the right appears when the MODE is **iQ CONTROLLED PROBE**. A secondary weld control, **PEAK POWER** has been selected.

MAX TIME, a secondary parameter, can be programmed in its range of 0-30.00 seconds.

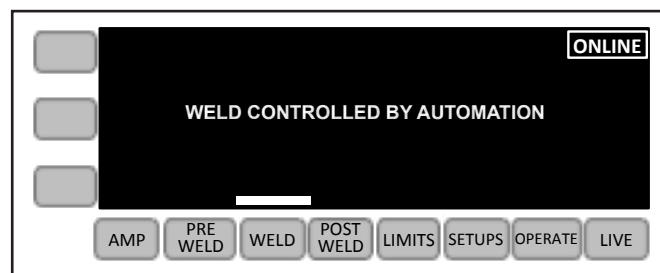


Figure 6-19 Weld Menu, Mode: Automated Probe

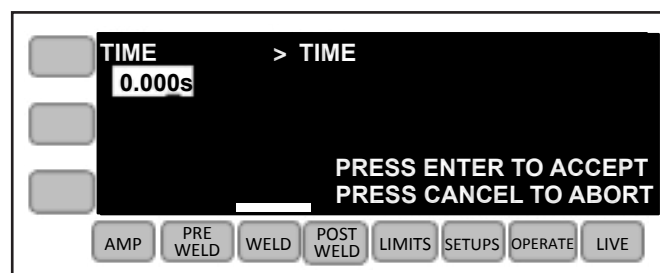


Figure 6-20 Weld Menu, Mode: iQ Controlled Probe

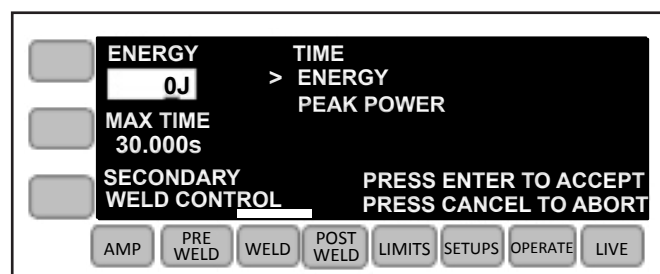


Figure 6-21 Weld Menu, Mode: iQ Controlled Probe, Probe Generator has Time and Energy

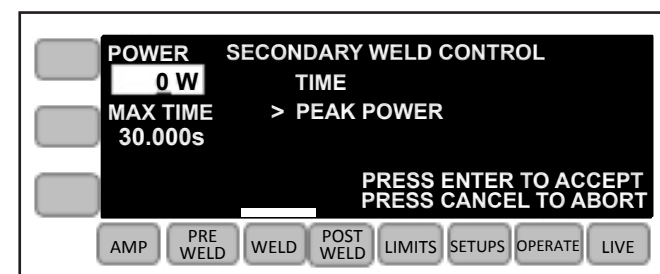


Figure 6-22 Weld Menu, Mode: iQ Controlled Probe with Secondary Weld Control

POST-WELD

Hold

The POST WELD menu seen in Figure 6-23, shows the message that is displayed if the mode was set to iQ CONTROLLED MODE using the PRE WELD display. The +/- keys move the selection arrow up and down.

When TIME has been selected as the HOLD control method, the menu appears as shown in Figure 6-24 to the right.

Note that TIME is highlighted, ready to be changed.

NOTE

HOLD and AFTERBURST are not available as soft keys if AUTOMATED PROBE MODE was selected in the PRE WELD menu.

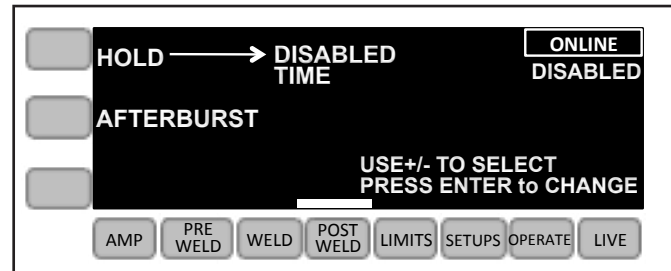


Figure 6-23 Post Weld Display, Hold Disabled

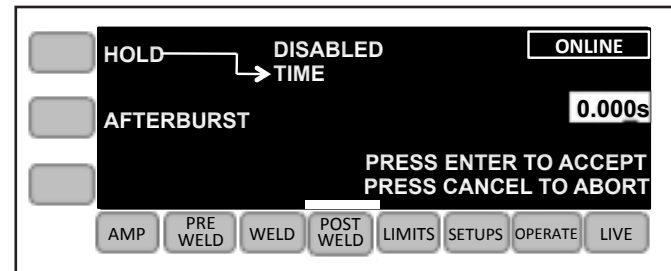


Figure 6-24 Post Weld Display, Time as Hold Method

NOTE

When the POST WELD key is pressed, the parameter last accessed is selected, and it is ready to be changed.

Continued

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Afterburst

The menu shown in Figure 6-25 at the right appears if the AFTERBURST soft key has been pressed in the POST WELD menu.

The menu to the right in Figure 6-26, is displayed when AFTERBURST is enabled.

Then, Afterburst parameters - Amplitude, Delay, and Duration - are selected, and values are applied to them as necessary.

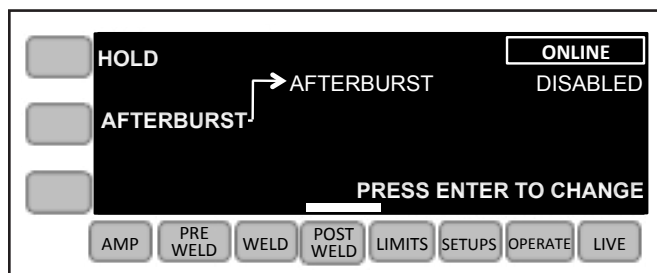


Figure 6-25 Post Weld Display, AFTERBURST Pressed

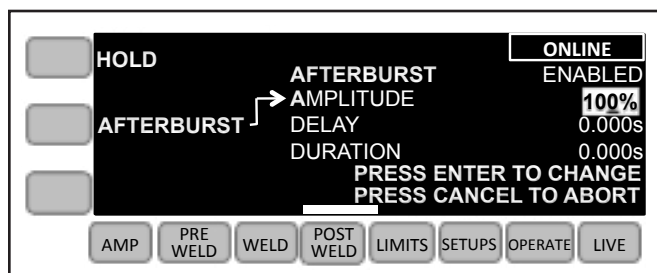


Figure 6-26 Post Weld Display, AFTERBURST Enabled

LIMITS

The LIMITS menu seen in Figure 6-27, shows what is displayed when in either iQ CONTROLLED PROBE or AUTOMATED PROBE.

In the example shown to the right, the DISPLAY EN-ABLED soft key was pressed to select ENABLED. Press the key again to select DISABLED.

This example illustrates that with a Time only generator, TIME is the only limit to be set.

Bad Limits

To enable Bad Limits, press the BAD soft key and select ENABLED. The display will appear like the one in Figure 6-28.

Suspect Limits

To enable Suspect Limits, press the SUSPECT soft key, and select ENABLED. The display will appear like the one shown in Figure 6-29.

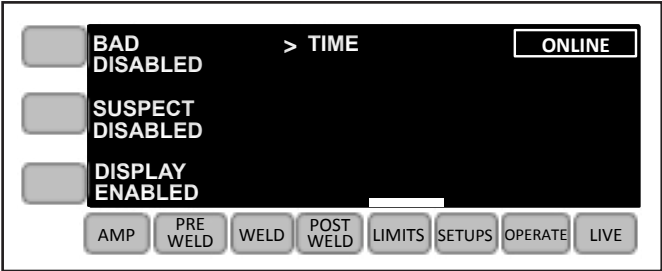


Figure 6-27 Limits Menu with Time Only Generator

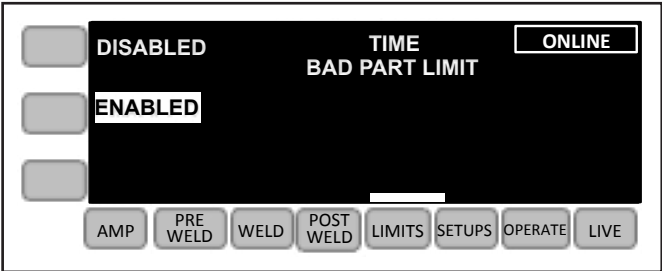


Figure 6-28 Limits Menu, Enabling Bad Part Limits

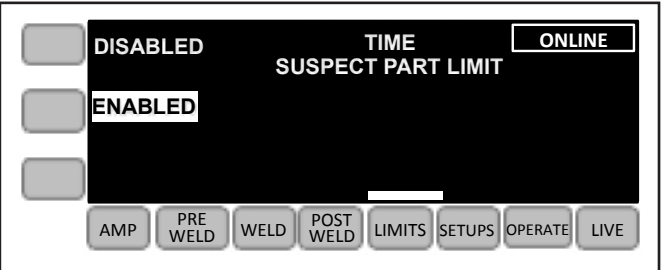


Figure 6-29 Limits Menu, Enabling Suspect Part Limits

Continued

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Setting Upper and Lower Limits

Setting upper and lower limits for both bad and suspect parts uses the same procedure.

As an example, Figure 6-30 to the right shows how the display appears after Suspect **ENABLED** was pressed. See Figure 6-29.

Press the **LOWER LIMIT** soft key, and enter a value using the +/- keys to choose digits. Press **ENTER** when finished.

Press the **UPPER LIMIT** soft key, and enter a value using the +/- keys to choose digits. Press **ENTER** when finished.

When limits have been entered, Press the **DONE** soft key.

Continue in this way setting upper and lower limits for any other parameters in your process.

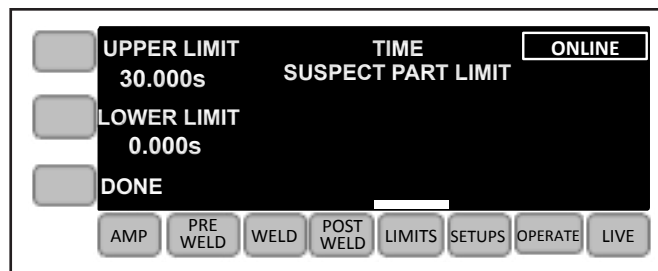


Figure 6-30 Limits Menu, Selecting Upper and Lower Part Limits

NOTE

TIME has a range of 0.000 seconds to 30.000 seconds.
30.000s is the upper limit for this parameter.

SETUPS

Setup Control

The SETUPS menu seen in Figure 6-31, shows that iQ SYSTEM is the default setup control setting for this menu.

SELECT SETUP is the bottom soft key in this case.

If AUTOMATION is selected, the bottom soft key would be: EDIT SETUP.

Press SELECT SETUP, and a screen similar to the one shown in Figure 6-32 to the right is displayed.

When the > is next to the desired setup, press the SELECT SETUP soft key, or the ENTER key.

Then, the previous screen will be displayed.

Pressing CANCEL would display the previous screen without any setup being chosen.

Name Setup

The menu shown to the right in Figure 6-33 is displayed when the > is moved to NAME SETUP.

The name of the current setup that is being edited (dependent on SETUP CONTROL) is highlighted and ready for editing.

Pressing ENTER saves the name.

Pressing ERASE NAME changes the name back to the default. (In this example, Setup #1).

When the setup name is not highlighted, there is a box around it. This indicates that pressing the soft key next to the box allows the box to be edited.

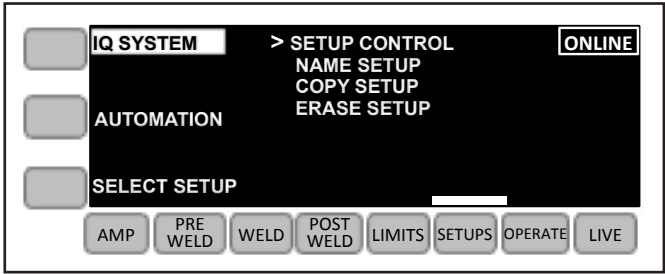


Figure 6-31 Setups Menu, Default Display

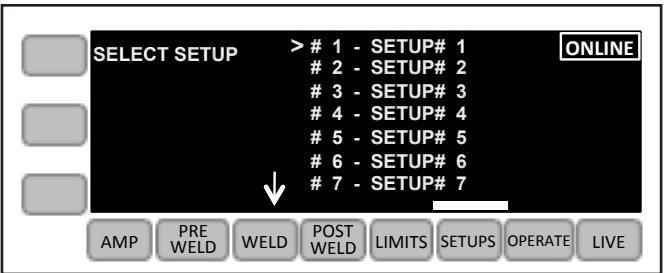


Figure 6-32 Setups Menu, Select Setup

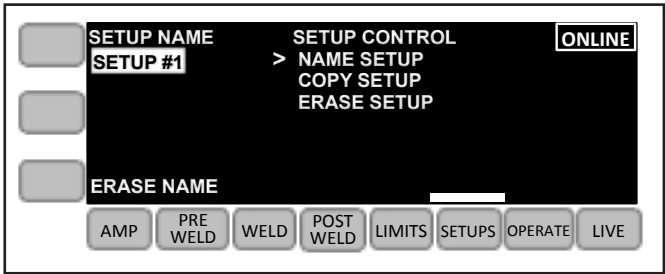


Figure 6-33 Setups Menu, Name Setup

NOTE

There are a possible 16 setups.

Continued

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Copying a Setup

Move the > next to COPY SETUP as shown in Figure 6-34.

The current setup being used or edited is displayed under COPY FROM.

Copy From

When the COPY FROM soft key is pressed, a list of setups, as shown in Figure 6-35 to the right, is displayed.

Use the + and - keys to scroll through the list.

Press ENTER to make the setup the COPY FROM selection.

Copy To

Pressing the COPY TO soft key will bring up the same menu once again (Figure 6-35).

Use the + and - keys to scroll through the list.

Press ENTER to make the setup the COPY TO selection.

When the COPY SETUP soft key is pressed, the screen shown in Figure 6-36 is displayed - for about 5 seconds.

The next screen displayed is the COPY SETUP screen as shown in Figure 6-34 above.

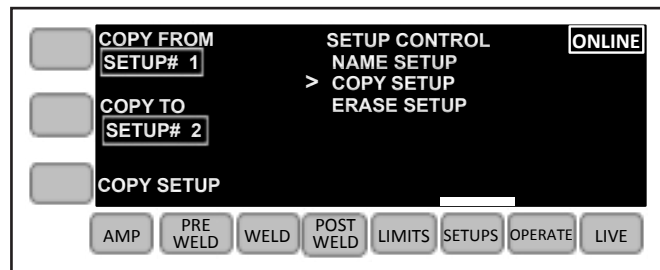


Figure 6-34 Setups Menu, Copy Setup

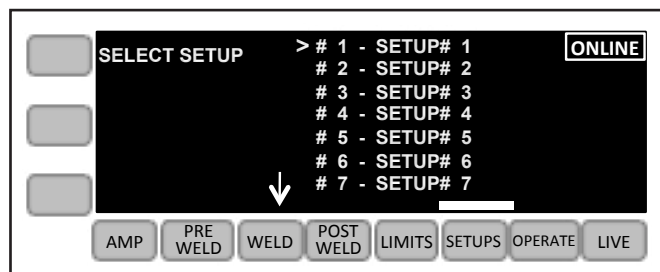


Figure 6-35 Setups Menu, Copy From/To Setup

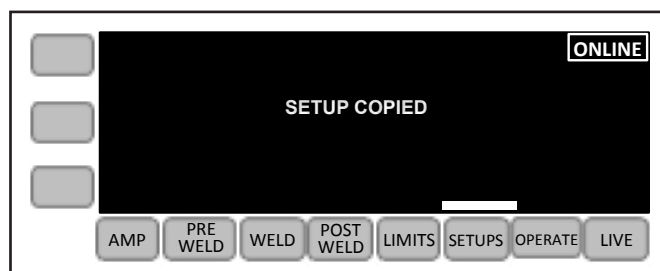


Figure 6-36 Setups Menu, Setup Copied Confirmation

Continued

Erase Setup

Move the > next to ERASE SETUP as shown in the Figure 6-37.

The current setup or all setups can be erased.

Erase Current Setup

Press the CURRENT SETUP soft key to bring up the display shown in Figure 6-38.

Pressing YES will return the setup (that is currently being run or edited) to default values.

Pressing NO or CANCEL will return the display to the SETUPS menu without erasing anything.

Erase All Setups

Pressing ALL SETUPS (as seen in Figure 5-37 above) affects all setups in the generator returning them all to default values.

The screen message, if ALL SETUPS was selected, would read:

ARE YOU SURE YOU WANT TO ERASE
ALL SETUPS?

Confirm Erase

When YES is pressed, the screen shown in Figure 6-39 is displayed for about 5 seconds. Then, the ERASE setup menu is shown.

If ALL SETUPS was chosen in the setup menu, the message would be: ALL SETUPS ERASED.

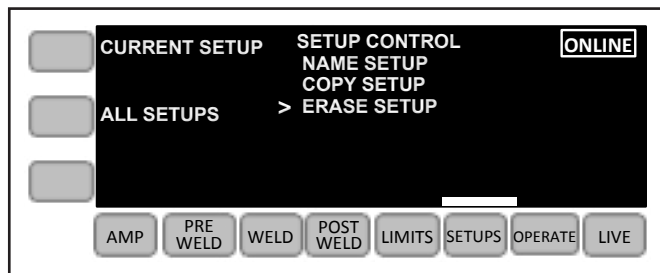


Figure 6-37 Setups Menu, Erase Setup

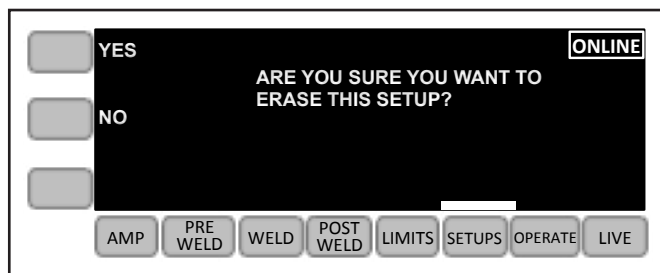


Figure 6-38 Setups Menu, Question Erase

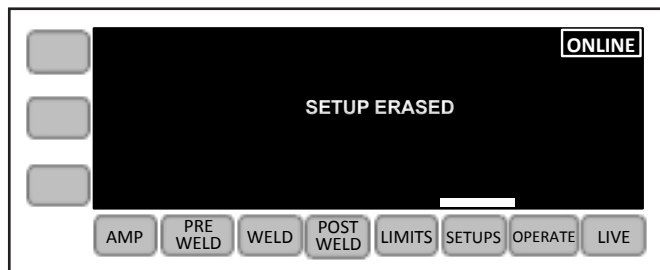


Figure 6-39 Setups Menu, Confirm Erase

OPERATE

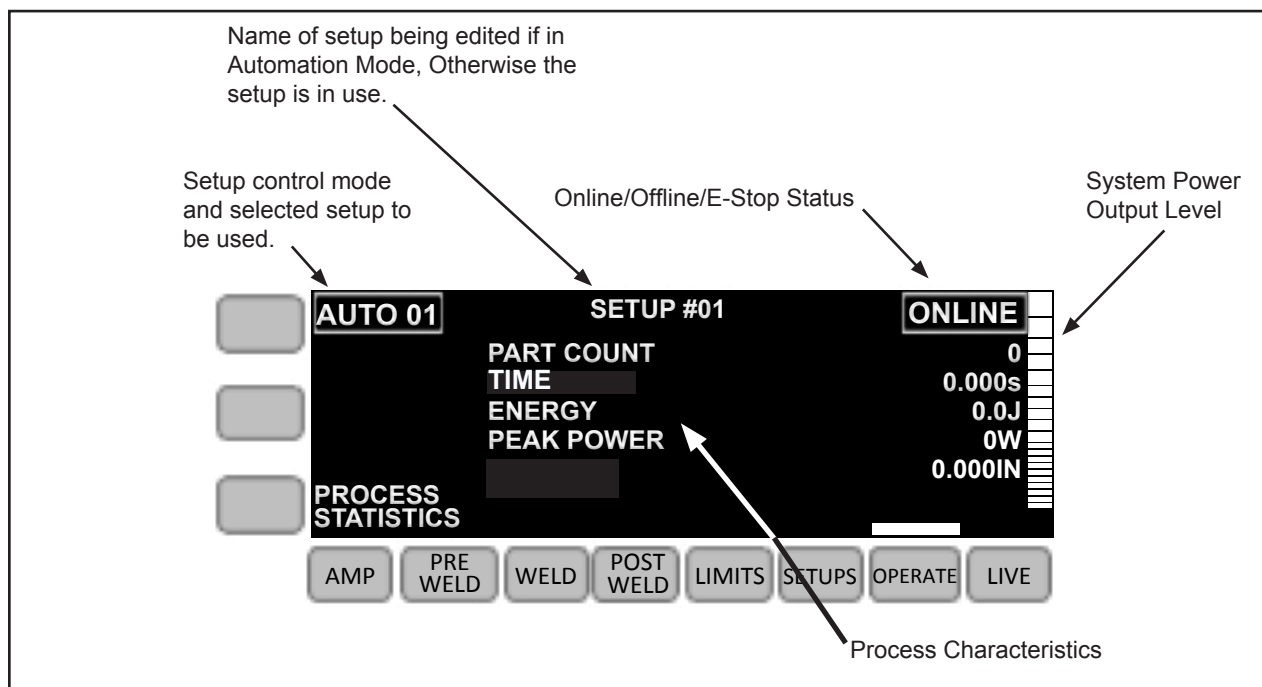


Figure 6-40 Operate Screen - I

When the generator is powered up, there is an initial screen that shows system information. That is followed by the Operate screen as shown in Figure 6-40 above.

This is a display only screen. The values displayed are from the last weld cycle. The operator can access this screen by pressing the OPERATE hot key.

The process characteristics shown in Figure 6-40 above are the ones where part limits have been enabled, or are those that have been selected to display.

Continued

When the PROCESS STATISTICS soft key is pressed, the display as shown in Figure 6-41 is seen. The total part count along with subtotals for good, bad, and suspect parts are displayed.

Percentages shown are of the total part count.

Example: Number of GOOD parts divided by the total PART COUNT multiplied by 100 equals the percentage of GOOD parts.

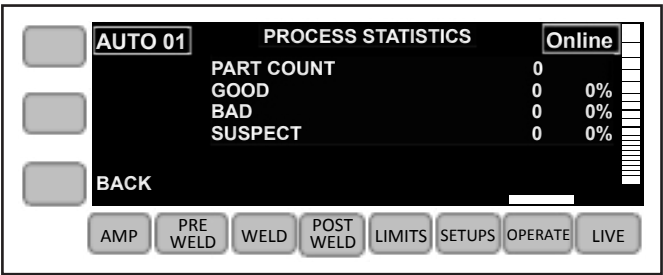


Figure 6-41 Operate Screen - 2

LIVE

When the LIVE hot key is pressed, the display as shown in Figure 6-42 to the right is seen.

This is also called the Live Data screen.

The screen shows the current value of the parameters shown. These values are shown regardless of whether the generator is in cycle or not.

IN CYCLE

When the LIVE hot key has been pressed, and the generator is in cycle, the screen shown in Figure 6-43 is displayed.

The screen shows the current value of the parameters shown.

TEST

When the TEST soft key has been pressed, and the generator is online, the screen shown in Figure 6-44 is displayed.

The screen shows the current value of the parameters shown.

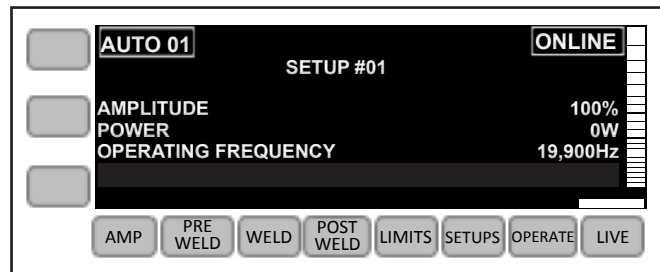


Figure 6-42 Live Data Screen

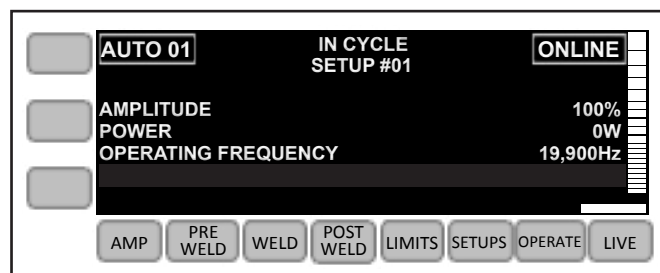


Figure 6-43 In Cycle Screen

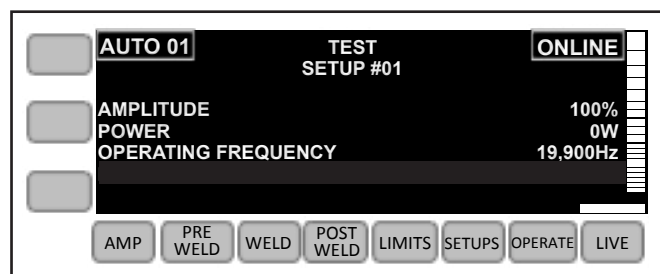


Figure 6-44 Test Screen

Using the INFO Menus

Press the INFO key, and the menu shown to the right in Figure 6-45 appears.

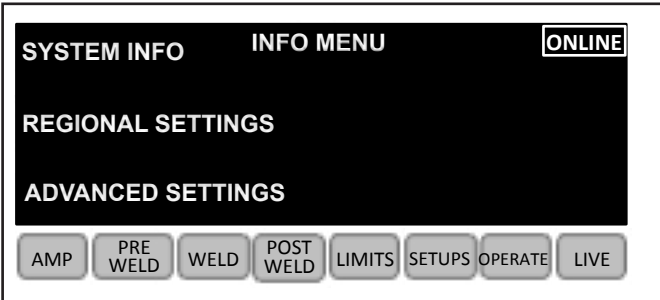


Figure 6-45 Info Menu Display

SYSTEM INFO - To display information about the generator hardware, press the SYSTEM INFO button. Figure 6-46 shows an example display of that information.

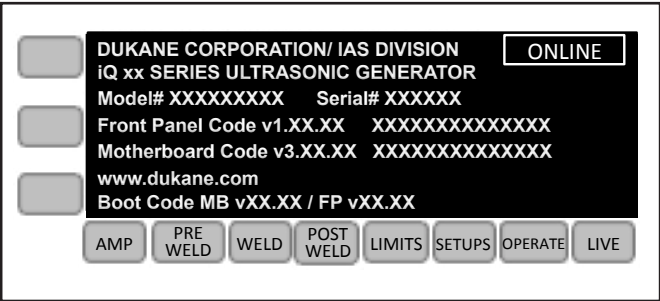


Figure 6-46 System Info

REGIONAL SETTINGS - Pressing the REGIONAL SETTINGS button allows setup for LANGUAGE (Figure 6-47), and it allows setup for UNITS.

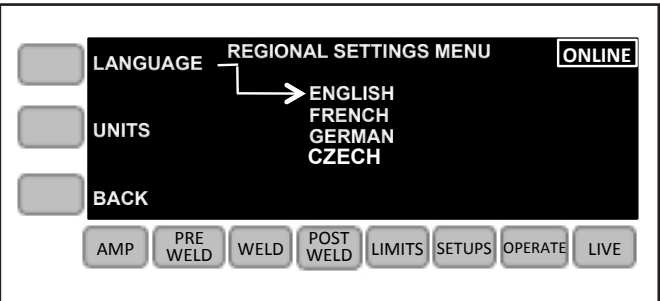


Figure 6-47 Regional Settings, Language Menu

UNITS - To set up preference for units press the INFO key, go to the REGIONAL SETTINGS MENU, and then to the UNITS key. See Figure 6-48.

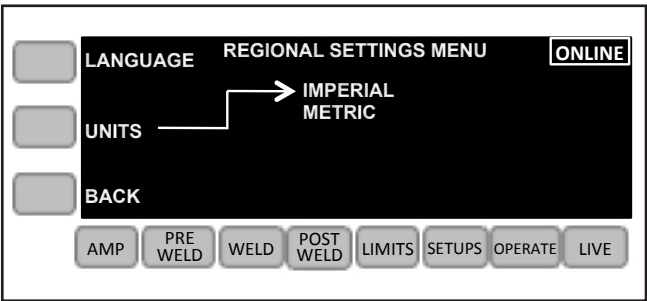


Figure 6-48 Regional Settings, Units Menu

Continued

Continued from Previous Page

ADVANCED SETTINGS - This part of the INFO menu gives access to the three sub-menus, Adv Process Control, System Status IO, and Miscellaneous and their menu items as shown below in Figure 6-49.

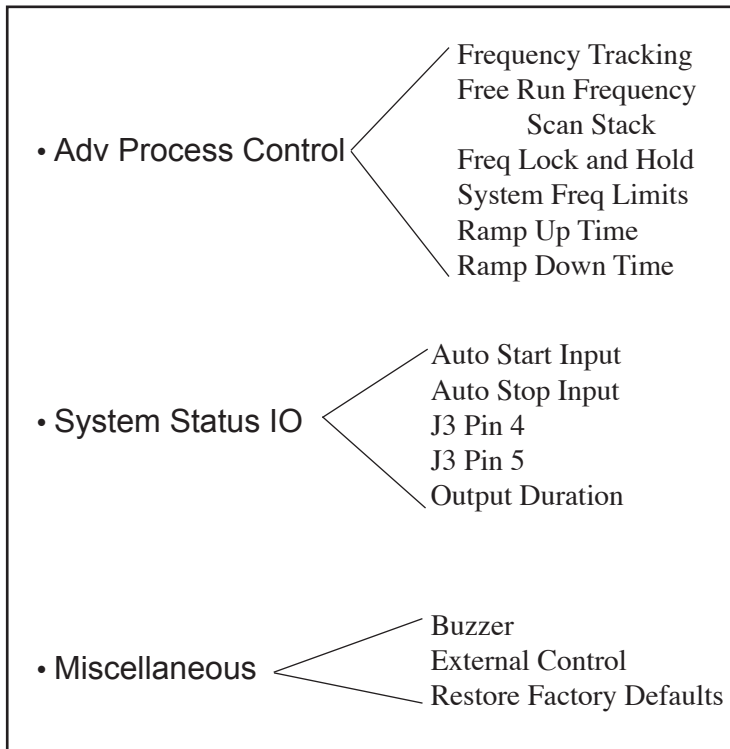


Figure 6-49 Advanced Settings Menu Overview

Pressing the **ADVANCED SETTINGS** button brings up a **WARNING** message that modifying these settings may damage the unit or ultrasonic stack. A prompt is given to either continue or abort.

If continuing, the **ADV PROCESS CONTROL** sub-menu is displayed. See Figure 6-50.

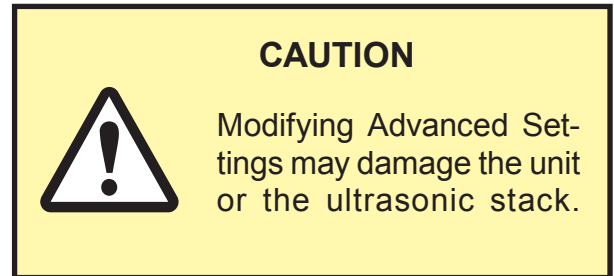


Figure 6-50 Advanced Process Control Menu

Continued

If the RESTORE DEFAULTS key is pressed while the Adv Process Control menu is displayed, the screen shown at right (Figure 6-51) is seen.



Figure 6-51 Restore Defaults, Adv Process Controls

If the defaults are restored, the display with the confirmation message shown in Figure 6-52 at right is shown for 5 seconds.

After that, the display will once again appear as it does in Figure 6-50 (but with default values).

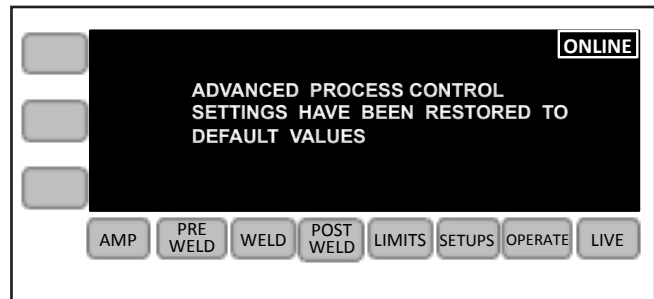


Figure 6-52 Restore Defaults, Confirmed, Advanced Process Control

Continued

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Adv Process Control Sub-menu Items

The six sub-menu items - Frequency Tracking, Free Run Freq, Freq Lock and Hold, System Freq Limits, Ramp Up Time, and Ramp Down Time and their corresponding displays are shown to the right and on the next page. Descriptions are provided below.

1) Frequency Tracking

When enabled, at the end of each cycle the operating frequency is applied to the Free Running Frequency setting. It's based on a 16 point average. Therefore, after 16 cycles, the actual operating frequency will be the Free Running Frequency setting. If the generator has not been cycled for a minimum of 5 minutes, the generator will request that the stack be scanned in order to verify the optimum Free Running Frequency setting. For more information about Frequency Tracking, refer to our *Application Note 513* on the Dukane website at: http://www.dukane.com/us/DL_ApplData.asp

2) Free Run Freq

Free run is the frequency at which the generator drives the ultrasound output pulses until a valid feedback signal is detected. Typically this value should be below the operating frequency of the stack

Adjust manually within the prescribed limitations for your particular generator model.

Scan Stack

To scan the stack: Scroll to Free Run Frequency in the displayed list and select the Scan Stack soft key. Follow the displayed instructions. See Figure 6-54 to the right.

When scan is complete, the scan results appear as in the example shown in Figure 6-55.

For more detail on the Scan Stack feature please refer to our website to download:

Application Note 512 at http://www.dukane.com/us/DL_ApplData.asp

until the end of the weld.

Enable or Disable this feature.

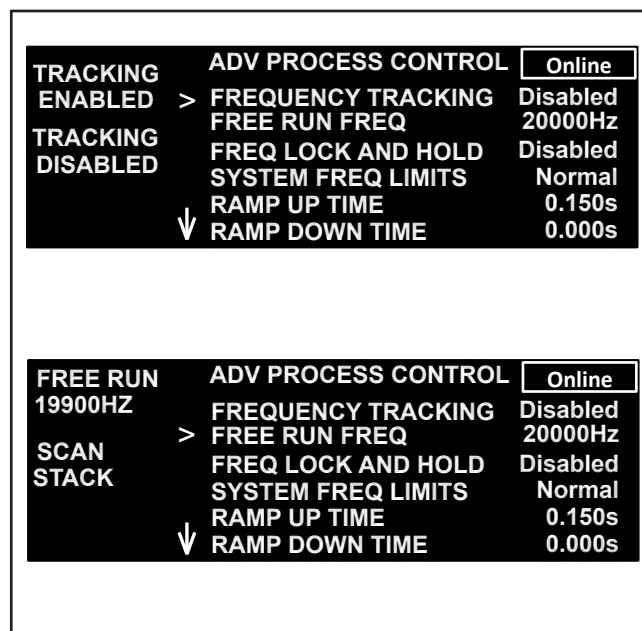


Figure 6-53 Advanced Process Control Sub-menu Items A

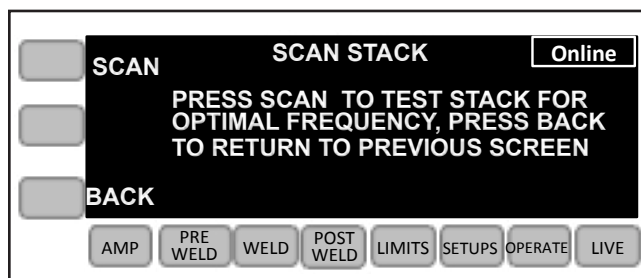


Figure 6-54 Scan Stack - 1

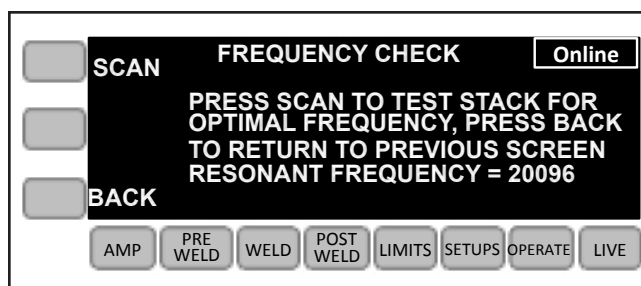


Figure 6-55 Scan Stack - 2

Continued

3) Frequency Lock/Hold

When frequency lock and hold is disabled, the frequency of the stack is tracked by changing the frequency of the ultrasound driving pulses to match the actual operating frequency of the stack.

When enabled the frequency of the feedback is tracked until lock is achieved. Then it is ignored and the ultrasound output remains at a fixed frequency until the end of the weld.

For more information about Frequency Lock/Hold, refer to our **Application Note 505** on the Dukane web-site at: http://www.dukane.com/us/DL_ApplData.asp

4) System Freq Limits

Limits can be: Wide, Normal, Narrow, or Manual.

Wide - In wide mode the upper and lower frequency limits are set to the maximum and minimum allowed frequencies for the generator. These values are dependent on the system frequency of the generator.

Normal - In Normal mode the upper and lower frequency limits equal the free run frequency - 500Hz.

Narrow - In Narrow mode the upper and lower frequency limits equal the free run frequency - 200Hz.

Normal, Narrow, or Wide - *Enter Upper and Lower Limits within prescribed limitations for your particular generator.*

Manual - In Manual mode the user sets the upper and lower frequency limits. To be valid, the settings must be within the maximum and minimum values for the generator and at least 25Hz greater than the "upper" free run frequency and 25Hz less than "lower" free run frequency.

Manual - *Enter Upper and Lower Limits.*

NOTE

Larger, high amplitude horns may require a longer ramp up time to properly start.

NOTE

Why System Frequency Limits Modes Might be Chosen

Wide - This mode is primarily used for testing "bare" transducers (no booster or horn attached).

Normal - This mode is the one most often used covering a wide variety of horns.

Narrow - This mode is used when the acoustic stack has known unwanted frequencies that are close to the main operating frequency.

Manual - This mode allows for a frequency range to include only frequencies that are wanted, and excluding unwanted frequencies.

LIMITS	ADV PROCESS CONTROL	ONLINE
NORMAL	FREQUENCY TRACKING	DISABLED
	FREE RUN FREQ	20000Hz
UPPER	FREQ LOCK AND HOLD	DISABLED
20400Hz	SYSTEM FREQ LIMITS	NORMAL
	RAMP UP TIME	0.150s
LOWER	RAMP DOWN TIME	0.000s
19400Hz		

TIME	ADV PROCESS CONTROL	ONLINE
0.150s	FREQUENCY TRACKING	DISABLED
	FREE RUN FREQ	20000Hz
	FREQ LOCK AND HOLD	DISABLED
	SYSTEM FREQ LIMITS	NORMAL
	RAMP UP TIME	0.150s
	RAMP DOWN TIME	0.000s

TIME	ADV PROCESS CONTROL	ONLINE
0.000s	FREQUENCY TRACKING	DISABLED
	FREE RUN FREQ	20000Hz
	FREQ LOCK AND HOLD	DISABLED
	SYSTEM FREQ LIMITS	NORMAL
	RAMP UP TIME	0.150s
	RAMP DOWN TIME	0.000s

 **Moving to the Next Sub-menu**

When > is next to RAMP DOWN TIME, and the down key (minus) is pressed, the next sub-menu for System Status I/O replaces the Adv Process Control sub-menu.

Figure 6-56 Advanced Process Control Sub-menu Items B

Continued

Continued from Previous Page

6) Ramp Up Time

Ramp up time increases the amplitude linearly in the programmed time period at the start of the weld, from zero to the programmed amplitude level. This brings the stack up to operating amplitude smoothly preventing shock stress.

Factory setting is 0.150 seconds.

Range is 0.000 to 1.250 seconds.

7) Ramp Down Time

Ramp down time decreases the amplitude linearly to zero in the programmed time period following the end of the weld, when ultrasound is shutting off.

Factory setting is 0.000 seconds.

Range is 0.000 to 0.250 seconds.

SYSTEM STATUS I/O Sub-menu

The SYSTEM STATUS I/O sub-menu is displayed in Figure 6-57.

If the RESTORE DEFAULTS key is pressed while, the SYSTEM STATUS I/O sub-menu is displayed, the screen shown in Figure 6-58 is seen.

If YES is chosen, the defaults are restored, and the display with the confirmation message shown in Figure 6-59 is shown for 5 seconds.

After that, the display will once again appear as it does in Figure 6-57.

NOTE**Ramp Down Time**

Ramp Down Time extends the service life of complex acoustic stacks by minimizing stresses encountered during the process of shutting off the ultrasound. It is especially recommended for very large horns, or when the ultrasound is shut off in air.

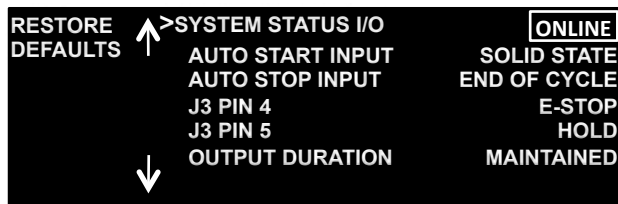


Figure 6-57 System Status I/O Sub-menu

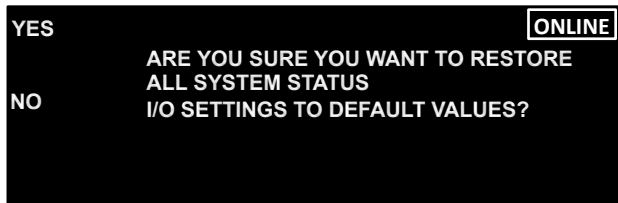


Figure 6-58 System Status I/O Restore Defaults?

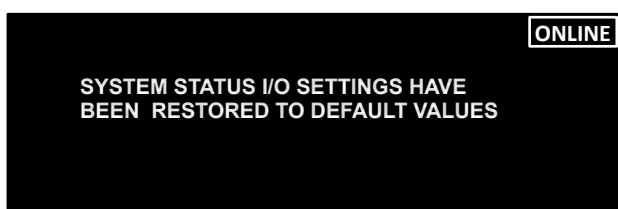


Figure 6-59 System Status I/O Defaults Restored

Continued

Continued from Previous Page

System Status I/O Sub-menu Items

The five sub-menu items and their corresponding displays (Figure 6-60) are shown on this page:

1) Auto Start Input

Solid State, or Mechanical - If mechanical is chosen, a value (0.000 to 0.100 seconds) must be given for Debounce.

2) Auto Stop Input

Choose to Disable this, or select End of Weld, or End of Cycle.

3) J3 Pin 4

Choose the output signal for J3 Pin 4: E-Stop, or Overtemp

4) J3 Pin 5

Choose the output signal for J3 Pin 5: Hold, In Cycle, or In Cycle No AB

5) Output Duration

Choose either Maintained, or 100mS Pulse.

When > is next to OUTPUT DURATION, and the down key (minus) is pressed, the next sub-menu item for SYSTEM STATUS I/O appears. This is NETWORK.

SOLID STATE	↑	SYSTEM STATUS I/O	ONLINE
	>	AUTO START INPUT	SOLID STATE
		AUTO STOP INPUT	END OF CYCLE
MECHANICAL		J3 PIN 4	E-STOP
		J3 PIN 5	HOLD
	↓	OUTPUT DURATION	MAINTAINED

DISABLED	↑	SYSTEM STATUS I/O	ONLINE
	>	AUTO START INPUT	SOLID STATE
		AUTO STOP INPUT	END OF CYCLE
END OF WELD		J3 PIN 4	E-STOP
		J3 PIN 5	HOLD
END OF CYCLE	↓	OUTPUT DURATION	MAINTAINED

E-STOP	↑	SYSTEM STATUS I/O	ONLINE
	>	AUTO START INPUT	SOLID STATE
		AUTO STOP INPUT	END OF CYCLE
OVERTEMP		J3 PIN 4	E-STOP
		J3 PIN 5	HOLD
	↓	OUTPUT DURATION	MAINTAINED

HOLD	↑	SYSTEM STATUS I/O	ONLINE
	>	AUTO START INPUT	SOLID STATE
		AUTO STOP INPUT	END OF CYCLE
IN CYCLE		J3 PIN 4	E-STOP
		J3 PIN 5	HOLD
IN CYCLE NO AB	↓	OUTPUT DURATION	MAINTAINED

MAINTAINED	↑	SYSTEM STATUS I/O	ONLINE
	>	AUTO START INPUT	SOLID STATE
		AUTO STOP INPUT	END OF CYCLE
100 ms PULSE		J3 PIN 4	E-STOP
		J3 PIN 5	HOLD
	↓	OUTPUT DURATION	MAINTAINED

Figure 6-60 System Status I/O Sub-menu Items

Continued

Continued from Previous Page

6) Network

Enable or Disable DHCP, and monitor other aspects of the network.

Network Settings

The Network Settings screen as seen in Figure 6-61 has five elements:

1. **DHCP** - These initials stand for Dynamic Host Configuration Protocol. The protocol was established for assigning dynamic IP addresses to devices on a network.

DHCP is enabled by default, this ensures no network address contention will happen in the event that the generator is plugged into a network before the user assigns a static address. Most commonly DHCP is disabled and a statically assigned IP addresses are used in industrial networks.

When DHCP is enabled, the static IP address/subnet mask setting is ignored. You may need to contact your network administrator if you do not know whether to enable or disable DHCP.

2. **IP ADDRESS** - This **I**nternet **P**rotocol address is a number unique to a piece of equipment acting as an identifier when the equipment is connected to a network. This field is editable when DHCP is disabled.

You may need to contact your network administrator if you do not know what address to use.

3. **SUBNET MASK** - defines the subset of the network address which applies to the locally defined subnetwork. Generally, this setting must match other entities on the network. This field is editable when DHCP is disabled.

You may need to contact your network administrator if you do not know what mask to use.

4. **EIP CONN:** - Indicates the IP address of the controlling Ethernet/IP connection.

5. **LINK:** - Indicates the state of the Ethernet link. (up/down (plugged in or not), 10/100 Mbps, half/full duplex)

Moving to the Next Sub-menu

When > is next to **LINK:** and the down key (minus) is pressed, the **MISCELLANEOUS** sub-menu screen appears. See the next page.

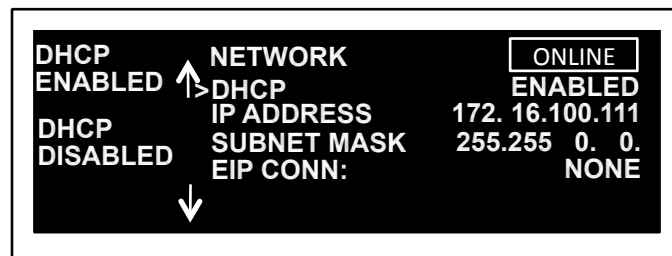


Figure 6-61 Network Settings

Miscellaneous Sub-menu Items

The three sub-menu items and their corresponding displays (Figure 6-62) are shown on this page:

1) Buzzer

Set the audible buzzer to sound:

At Top of Stroke - Enable or Disable, or

At Trigger - Enable or Disable

2) External Control

Choices are:

Disabled, or

Serial (Enter a Baud Rate)

3) Restore Factory Defaults

Press the RESTORE soft key to erase ALL setups and factory defaults.

An intermediate display allows for confirmation.

If confirmed, then another message is displayed as shown to the right.

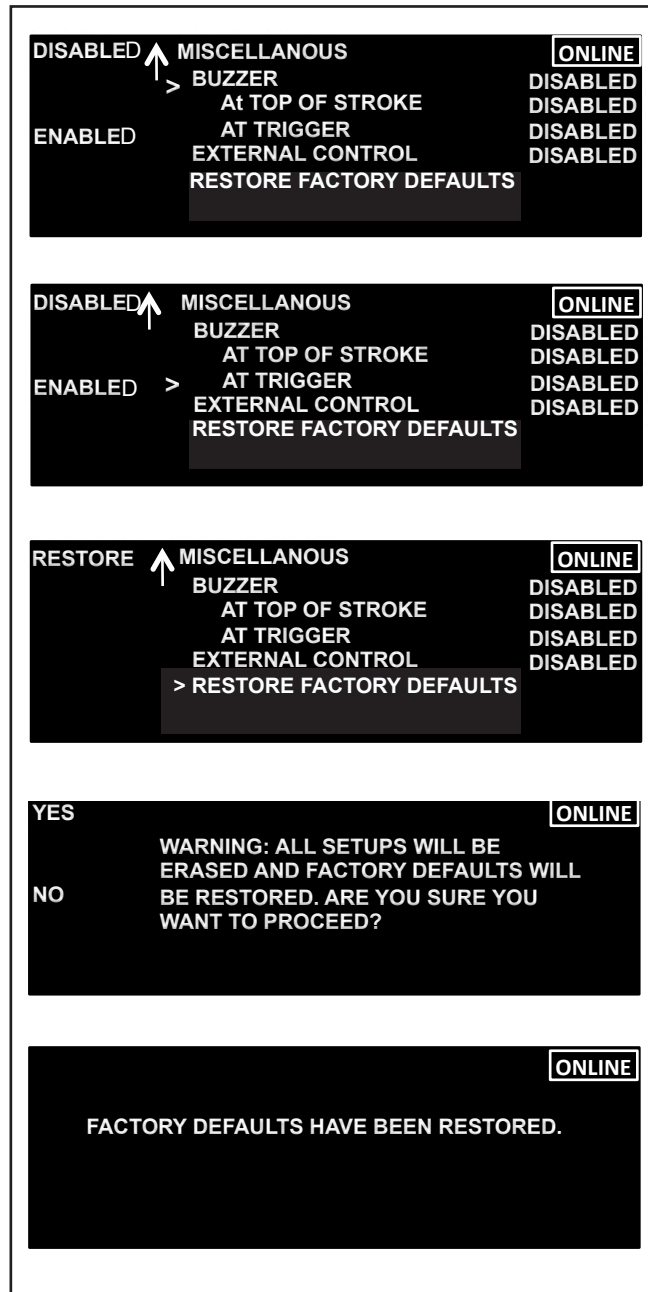


Figure 6-62 Miscellaneous Sub-menu Items

ALARMS

Terminology: Alarm refers to any fault, or error the generator might produce.

An alarm condition may occur. Figure 6-63 shows the format for a typical alarm display.

The list below gives general reference information for each alarm condition.

NOTE

Go to this web address:

<http://www.dukane.com/easyalarm>

for more information about the alarm's cause and remedy.



Figure 6-63 Alarm Message Screen

FAULTS:

- U100 Configuration Fault (Default Setup Corrupted, Model Number Incorrect, Serial Number Incorrect, Feedback Scaling Incorrect, etc)
- U103 Hardware Fault (Hardware Changed, Remote Amp Card removed?)
- U104 Frequency Overload Fault 1 (PLL Lock Fail)
- U106 **Peak Overload Fault**
- U107 NEG Peak Overload Fault
- U108 Average Overload Fault
- U109 Bad Current Loop Fault
- U110 Power not OK Fault
- U111 Over Temperature Fault
- U112 Frequency Overload Fault 3 (PLL Limit Exceeded)

INITIATE ERRORS:

- U300 Operate Switch 1 Pressed before Cycle Start
- U301 Operate Switch 2 Pressed before Cycle Start
- U302 Auto In switch closed at End of Cycle
- U304 Trigger switch closed before Cycle Start
- U305 Pre-trigger switch closed before Cycle Start
- U306 End Weld input enabled before Cycle Start
- U307 Ground Detect input enabled before Cycle Start
- U308 Generator or Press Not Ready

PROCESS ERRORS:

- U400 Weld Limits enabled for continuous Operation
- U401 Weld Time set to Zero
- U402 Weld Power set to Zero
- U403 Weld Energy set to Zero
- U404 Weld Distance set to Zero
- U405 Weld Position set to Zero
- U406 Max Trigger Time set to Zero
- U407 Forced Shutdown Fault
- U408 Trig Lost Early Fault
- U409 Trig Lost Weld Fault
- U410 Pre-trigger Overtravel Fault
- U412 Max Pre-trigger Time exceeded
- U413 Max Trigger Time exceeded
- U414 Max Trigger Delay Time exceeded

Table 6-I Alarm Messages

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SECTION 7

Process Control Settings

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User-Provided Process Control Overview

The generator includes a process control system to control welding process. The basic “B models” can be programmed to weld by time. “E model” generators can weld by time and energy. See Figure 13-2 for model number information.

Manual Welding

Generally, a trained operator will start the welding process using a hand probe with an activation switch that starts the welding controller that controls the duration of the ultrasonic power applied to the parts being welded. The operator applies an appropriate amount of pressure to the parts to be ultrasonically joined. Then the operator activates the welding cycle, and the process controller begins the ultrasound output for a time (or energy) period that will reliably weld the final assembly. The quality of the finished product is particularly dependent on the skill of the hand probe operator.

Automated Welding

This automated welding control approach is custom designed by the user and can be very simple or quite sophisticated, depending upon the user’s requirements. In most cases, a Programmable Logic Control (PLC) system will be used to initiate the welding process. Then the front panel process controller controls the welding process. Output signals from the PLC system will determine when the ultrasound or weld cycle starts. Control signals for a Multiple Probe Control (MPC) system can also be easily added, if needed. A variety of ultrasonic welding status output signals are available to the automation system, which are useful in monitoring the welding process.

Automated Process Control Input Signals

Refer to **Section 4** for the available input control signals on the system input connector. The ultrasound/cycle start activation input will always be used, with the other available control input signals optional, depending upon the user’s processing requirements. The Front Panel Control Lock input and the System Latch Reset input are used with the front panel controller. The Auto Stop input provides an added means to shut off the ultrasound output and the Remote Setup Bit inputs allows the automation system to switch the system setups remotely.

Status Output Signals

Refer to **Section 4** for the available status output signals that are on the system output connector. Note that some of the listed status output signals are not functional if the system is not equipped with certain optional features. Using the available status output signals, the automation system can easily monitor when the ultrasound output is activated and other fault status signals, to assist in controlling the automated welding process.

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SECTION 8

System Operational Testing

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System Verification Tests

Preliminary Setup

1. Plug in the AC line cord to the correct AC power outlet. See Table 13-II for the model power requirements.
2. Attach a compatible ultrasonic probe to the ultrasound output connector - J1.
3. Activate the AC Breaker/Switch **A** to the ON position.

Testing the Generator

(Complete steps 1-3 above, and then continue with steps 4, 5, and 6 below.)

4. The start up sequence begins. A short beep is given. The Lighted Power Indicator flashes for several seconds. Then the display shows identifying information about the generator. Next, the Lighted Power Indicator turns a steady GREEN. The start up sequence ends when the display shows the OPERATE screen.
5. System Operating Mode Key Tests (See Figure 8-2)

- a. Press the OFFLINE mode key **B**.

The display shows OFFLINE in the upper right hand corner.

- b. Press the TEST key **C**.

The ultrasound should not activate, and the SYSTEM POWER OUTPUT LEVEL bar graph **D** will stay off (no white bars in the graph area).

- c. Press the ONLINE key **E**.

The display shows ONLINE in the upper right hand corner.

- d. Press the TEST key **C**. Ultrasound should activate and the first segment of the SYSTEM POWER OUTPUT LEVEL bar graph should appear (a white bar in the graph area). Release the TEST key.

Ultrasound should deactivate, and the SYSTEM POWER OUTPUT LEVEL bar graph should be OFF (no white bars in the graph area).

6. Optionally, system status outputs can be monitored during this test.

The ultrasound status output activates only when ultrasound is active.

The power monitor output signal indicates the ultrasonic power level.

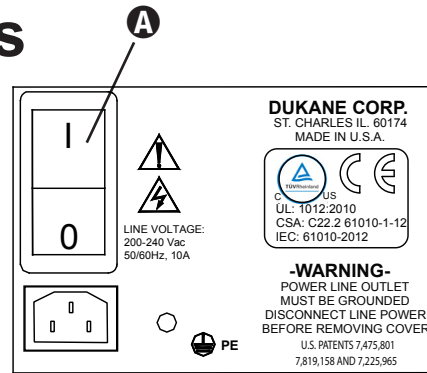


Figure 8-1 Rear Panel AC Breaker/Switch

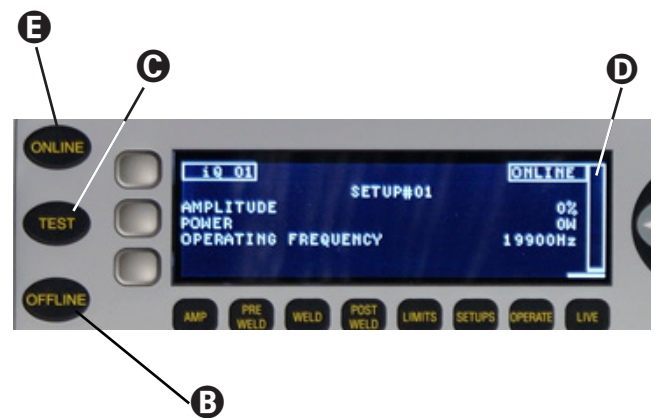


Figure 8-2 Testing the Generator

System Test

To test the system's ultrasound operation, perform the following steps.

1. For this test, the generator must be ONLINE. Make sure ONLINE appears in the upper right corner of the display.
2. Connect a probe to the generator ultrasonic output.
3. Place the probe so that the tip of horn is not in contact with anything. If you are using a hand probe, you may feel a slight vibration or sensation in your hand. This is normal. There should not be any loud or unusual noise.
4. Momentarily press the TEST key (C in Figure 8-3).
5. The first segment LED of the SYSTEM POWER OUTPUT LEVEL bar graph (D in Figure 8-3) turns white. The probe will operate as long as the TEST key is pressed.
6. When the TEST key is released, the SYSTEM POWER OUTPUT LEVEL bar graph turns off (no white in the bar graph area). This test cannot be performed with the generator OFFLINE.

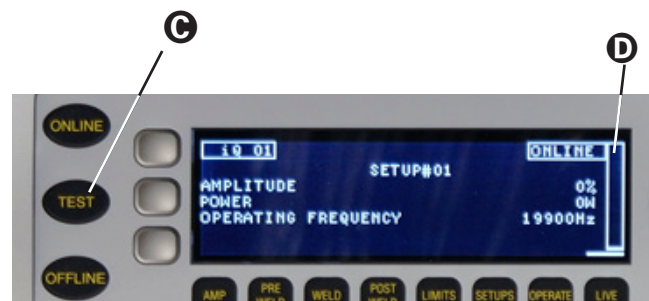
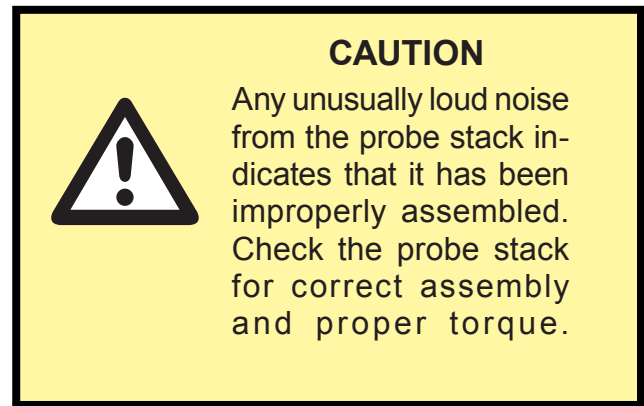


Figure 8-3 System Test

Probe Operation

1. If the generator is not online, press the ONLINE mode key (E in Figure 8-4). ONLINE will appear in the upper right hand corner of the display.
2. Hand Probe – Apply the probe tip to the components to be ultrasonically joined, and press the hand probe's activation switch.
Automation System – Activate the automation system program to trigger the generator. This will move the probe tip in contact with the components to be ultrasonically joined, and run a welding cycle.
3. Hand Probe – The programmed welding time or energy will be processed, and then the ultrasound will be shut off.
Automation System – The programmed weld time will be processed, and then the ultrasound will shut off.

NOTE

Neither a hand probe or an automation system can trigger the generator to produce an ultrasound output if the generator is OFFLINE.



Figure 8-4 Probe Operation

Stopping the Ultrasound Output

Press the OFFLINE key (B in Figure 8-4).
Ultrasound will deactivate.

System with a User-supplied Emergency Stop Switch

Press the emergency (E-STOP) switch, and the ultrasound signal will deactivate. - *This applies only if Auto Stop is wired to end user E-STOP circuits, AND Auto Stop is enabled.*

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SECTION 9

Troubleshooting

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No Ultrasonic Output Probe

Make sure that the probe coaxial cable is connected to the generator ultrasonic output connector J1. Basic generator models have the BNC connector on the rear panel. Also, make sure the probe stack was properly assembled.

Cables

Make sure that both the U/S coaxial and system I/O cables are securely connected. You must activate the ultrasound activation input to Pin 8 on the system input HD-15 connector either by the hand probe's control cable or with a custom automation input signal. Refer to Table 4-I, Generator Input Signals, for details.

Place the generator **OFFLINE**, and:

1. Check the coaxial cable for any signs of damage which may result in an open circuit preventing the cable from transmitting the signal from the generator to the probe.
2. If you have a mounted probe, replace the coaxial cable with a known good cable.
3. If you are using a hand probe, try a different known good probe to determine if the problem is related to the generator or the external cables and probe.

Generator

The generator will not produce an output signal when triggered if it is offline. (If the generator is **OFFLINE**, the system mode indicator shows **OFFLINE** in the upper right hand corner of the screen.) To change the system to **ONLINE**, press the **ONLINE** mode key. When **ONLINE**, the system mode indicator shows **ONLINE**. Verify that at least one segment on the bar graph lights when the ultrasonic activation input signal starts a welding cycle.

Operate Input

If you are using a hand probe, make sure the control cable and adapter cable are securely connected to the system I/O connector. The trigger switch on the hand probe activates the ultrasonic output through the control cable.

NOTE

The cable end of the system I/O connector is a mirror image of the panel connector. Figure 9-1 below shows the cable pinout. Make sure you have correctly wired the connector if you are using custom automation signals.

Also refer to Table 4-II for the cable color pin assignment.

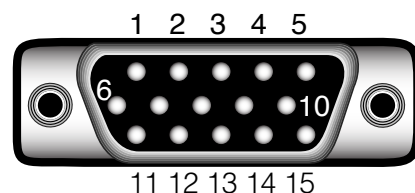


Figure 9-1 Cable End of System I/O Connector

Welding Problems

Weak Welds

Weak welds, or underwelding, is caused by insufficient energy being transmitted to the part. You can increase the weld pressure, increase the weld time or change to a higher gain booster to increase the amplitude to increase the energy delivered to the weld.

Excess Flash

The energy director may be too large. You can try to reduce the weld pressure and/or weld time. The parts may have too much shear interferences or a nonuniform joint dimension.

Inconsistent Welds

Variations in plastic due to filler materials and moisture absorption may lead to inconsistent welds. Fillers can be especially troublesome if they are not uniformly distributed, the content is too high or it contains too much or poor quality regrind or degraded plastic.

Check the horn and fixture alignment and parallelism. Check the alignment of the mating parts, shifting during welding or residual mold release on the parts.

Try welding by energy. This eliminates many inconsistencies. There should be no unusual or loud noise from the acoustic stack. If there is, disassemble the stack and reassemble.

Exchange the probe with another unit to see if the problem disappears. If not, exchange the generator with another unit to try and isolate the problem.

The horn amplitude may not be uniform if it has been machined, altered or damaged. All of these will change the resonant frequency of the horn. You can have the horn analyzed.

SECTION 10

Maintenance

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Front and Rear Panels Cleaning

- Do not use any solvents or abrasive cleaners on the any of the panels (including the LCD display).
- Do not spray any cleaning product directly on the panels.

To remove dust, first try gently dusting with a microfiber cleaning cloth. If further cleaning is needed, apply a small amount of screen cleaner to a soft microfiber cloth. Then, clean the panels/LCD display with the moistened cloth.

Screen Cleaning Solutions:

Make your own: Mix distilled water and white vinegar in 1 to 1 proportions. Pour this mixture into a spray bottle from which it can be used, or

Buy a cleaning solution: There are several on the market suitable for cleaning LCD screens.

- Do not spray or apply cleaner directly on the generator.
- Do not allow any liquid to collect around the AC power switch.

Display

Do not apply any pressure to the display.

Control Keys/Buttons

Control keys/buttons will respond to firm, gentle finger pressure. Please do not use sharp objects on the keys/buttons.

Chassis

Sheet Metal Cover

The cover is preformed to fit over the chassis and has protective grills over the cooling air vents. Keep the cover on at all times because there are high voltages present which could cause injury. The internal case also contains capacitors which continue to hold a high electrical charge, even after the power is shut off.

Air Ventilation Slots

Keep the ventilation slots free from obstructions. If excessive dust or dirt collects on the slots, wipe or vacuum them clean. Do not use compressed air to clean them as this may force the dirt inside the chassis.

Allow 5 inches (127 mm) of clearance outside each ventilation slot.

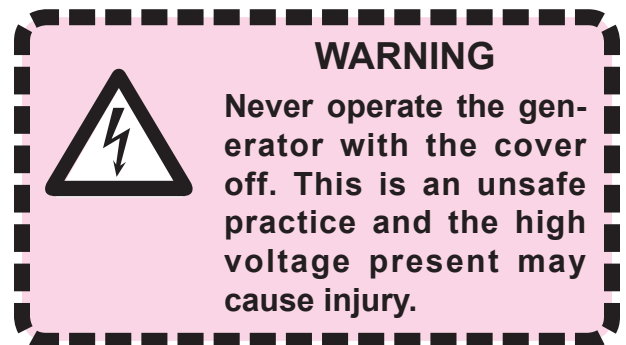
The air intake is on the right, and the exhaust is on the left. This is shown in Figure 3-3, Page 15.

I/O Connector

The Input/Output connector has a pair of 4-40 threaded jack screws to secure the connector. Make sure the screws are snug, but **do not overtighten them**.

AC Power Cord

The AC power cord should be kept in good condition and free from any cuts. The AC plug should be straight with no bent prongs.



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SECTION 11

Options

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This section of the User's Manual provides a general overview of some options/upgrades, all of which are subject to availability, for the basic ultrasonic generator.

Power Inlet Options

120V Systems for North America and Japan

120V systems for North America and Japan have a fixed (non-detachable) power cord.

This option is available on generators with power ratings up to 1200 Watts.

240V Systems

Generators with power ratings above 2400 Watts also have fixed power cords.

See Table 13-II in *Section 13, Specifications*.

NOTE

Refer to **Section 2 - Health and Safety**, Pages 8 and 9 for information about Electrical Safety including grounding.

I/O Panel Options

Single Connector System I/O Panel

See **B** in Figure 11-1 where the I/O panel is set up for the single I/O connector, a HD15F type. See Figure 11-2. The generator label for this connector is, **SYSTEM INPUTS/OUTPUTS**. Another label identifies the connector as J2.

The I/O panel can be customized with multiple types of connectors such as the single HD15F, terminal blocks, etc. Contact your local sales representative for more details.

Table 11-I shows an example of a customized option:

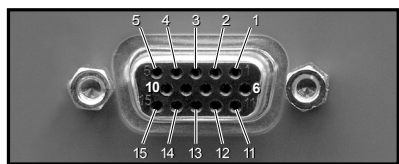


Figure 11-2 HD15F for System Inputs/Outputs Connector

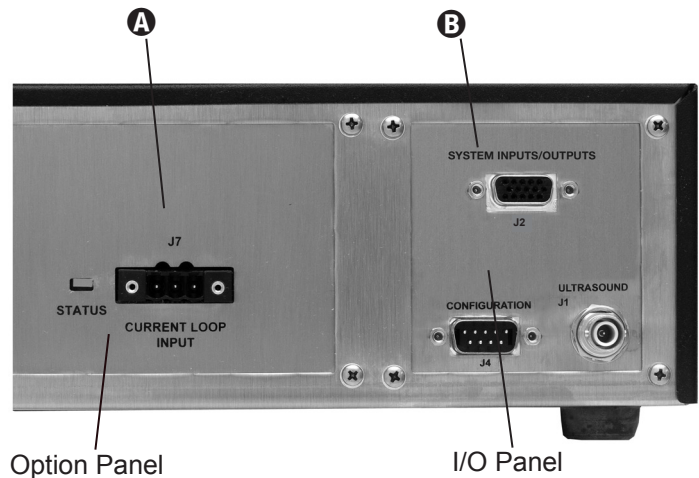


Figure 11-1 Option Panel and I/O Panel
(NOTE: Shown are the Option panel with Remote Control Module, and the I/O panel with single I/O connector.)

Pin	Signal Name	Signal Description
1	+22VDC	Current limited to 250mA maximum
2	Ground	22VDC Return (chassis ground)
3	Ground	
4	Not Used	No Connect
5	Ultrasound Active Status	Isolated Common
6	Overload Fault Status	Amplitude Monitor Common connected to ground
	Not Used	No Connect
8	U/S Activate	Ultrasound Activation/Cycle Start Input
9	Not Used	No Connect
10	Any Fault Status Output	System Fault Output
11	Not Used	No Connect
12	Amplitude Setting	Amplitude Monitor Output (10.0V = 100%)
13	Not Used	No Connect
14	Not Used	No Connect
15	Not Used	No Connect

Table 11-I HD15F Example of Customized System Inputs/Outputs Connector Signals

Multi-Probe Control (MPC) Interface and EtherNet/IP

Part Number - 110-4251

This optional module combines the EtherNet/IP and MPC interfaces. See Pages 31-32 for information on the EtherNet/IP connector.

The MPC Interface circuit board powers and controls an external MPC module. This external module, (that can be ordered with a minimum of two probe controls up to a maximum of 16 probe controls), must be purchased in addition to a basic generator for a fully functional MPC system.

Connections needed for the MPC Interface board and those required for the external MPC module are described below.

Optional MPC Interface Connections

Complete the steps for the basic connections as described on Pages 17-18. These involve:

- Grounding,
- Ultrasound Output,
- System Control Inputs/Status Outputs, and
- AC Line Input.

In addition to completing these first four or six steps, complete the two steps below to wire the MPC Control Inputs/Status Outputs as described.

Details about the various system connectors and their pin assignments are covered below.

- **MPC I/O** - MPC control/input signals and status output signals are carried in the I/O cables that should already be connected - See Inputs (J2) and Outputs (J3) in Figure 11-3.
- **MPC INTERFACE** - Attach one end of the MPC Interface cable (Dukane # 200-1408-XX) to the MPC INTERFACE connector on the *iQ* generator panel - MPC Interface in Figure 11-3. Connect the other end of the cable to the MPC INTERFACE connector on the right rear of the MPC module.

NOTE

The MPC Interface cable is a separate line item on the iQ generator system order. The -XX at the end of the cable number specifies cable length. This will vary depending on your MPC installation.

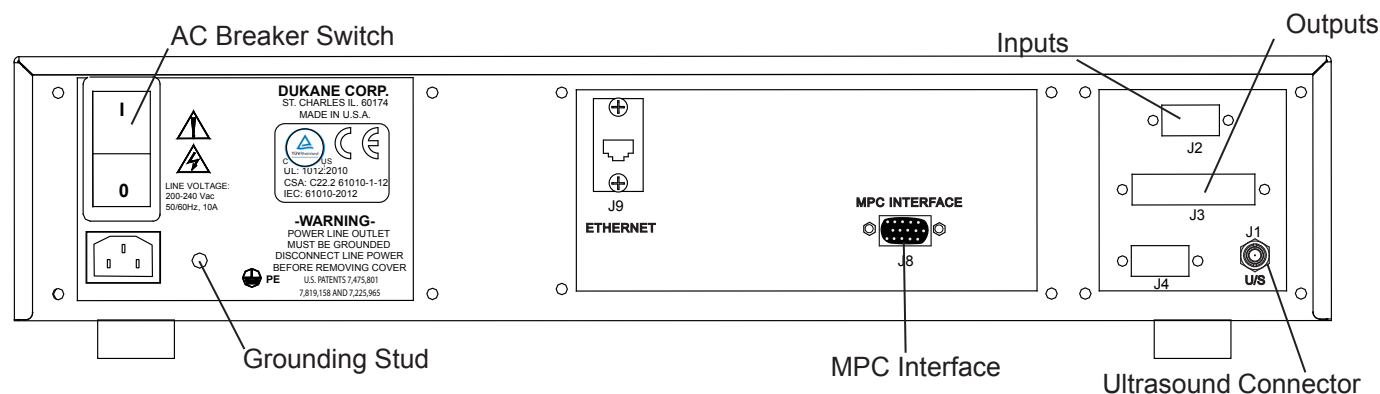


Figure 11-3 Generator Rear View - Optional MPC Model

See NOTE on the MPC cable above.

See NOTE on Page 100.

Continued

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MPC I/O Connections

Signal names and Pin numbers and the connectors related to the MPC option are shown in the table below. See the pages referred to in the table for more information about the signals.

Pin	Signal Name	Connector
3	Setup Bit 0 Input	J2 (Page 24)
4	Setup Bit 1 Input	
5	Setup Bit 2 Input	
6	Setup Bit 3 Input	
18	MPC Ready Out	J3 (Page 29)

Table 11-II MPC I/O Connector Signals**MPC Probe Control**

When the optional MPC Interface and MPC I/O connectors are used, the generator has the capability of controlling as many as sixteen compatible probes. One probe can be turned on at a time while the sequence of probe activation is determined by the user's automation. The table below shows how the setup bit inputs correspond to the probes.

MPC				Probe Selected
3	2	1	0	
Off	Off	Off	Off	1
Off	Off	Off	On	2
Off	Off	On	Off	3
Off	Off	On	On	4
Off	On	Off	Off	5
Off	On	Off	On	6
Off	On	On	Off	7
Off	On	On	On	8
On	Off	Off	Off	9
On	Off	Off	On	10
On	Off	On	Off	11
On	Off	On	On	12
On	On	Off	Off	13
On	On	Off	On	14
On	On	On	Off	15
On	On	On	On	16

Table 11-III MPC Setup Bit Inputs**NOTE****Ultrasound Output Connector**

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels this can exceed 2 amps of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

Continued

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MPC Interface Installation Guide

The MPC interface is designed for assembly systems where one ultrasonic generator is sequenced to as many as 16 ultrasonic probes.

The MPC interface is typically supplied as a stand-alone bench-top unit, or as a component that can be mounted in a through-panel configuration.

No special installation is needed for a stand-alone MPC interface that can be put on a bench top or a shelf.

Use the following installation recommendations for a panel mounted MPC interface.

Cut Outs

For panel mounted modules:

Use Figure 11-4 below to determine the size of the cutout needed for your equipment panel.

Make the appropriate cut, and install the MPC interface securing the mounting flange to the equipment panel before continuing with the cable connections.

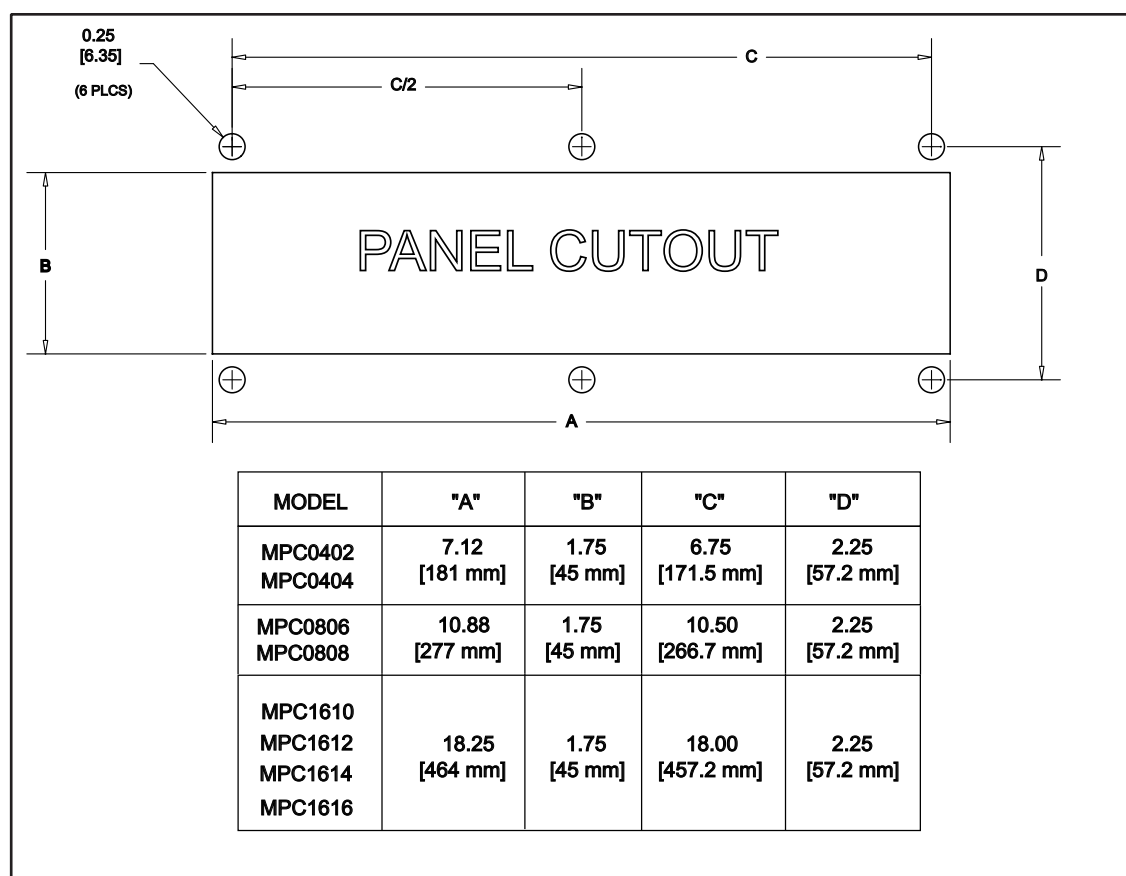


Figure 11-4 MPC Module Cutout Guide

Continued

Connecting Cables

For stand-alone interfaces and securely installed panel mounted interfaces:

Rear Connections

Refer to Figure 11-5 below, and complete these connections.

- 1. Earth ground - Connect one end of a user-supplied 14-Gauge ground wire to the ground connection at the rear of the MPC, **A** in Figure 11 -5. Connect the other end of the wire to an earth ground potential at the electrical box that supplies power to the equipment (or to the equipment enclosure into which your system is installed).
- 2. U/S (ultrasonic) cable (Dukane P/N 200-479-XX - Order the correct cable length for your installation.) - Connect one end of the cable to the left rear U/S connector of the MPC interface, **B** in Figure 11 -5. The other end of the cable connects to J1 of the ultrasonic generator.
- 3. MPC Interface cable (Dukane P/N 200-1408-XX - Order the correct cable length for your installation.) - Connect one end of the cable to the right rear MPC Interface connector, **C** in Figure 11 -5. The other end of the cable connects to the MPC INTERFACE connector on the ultrasonic generator.

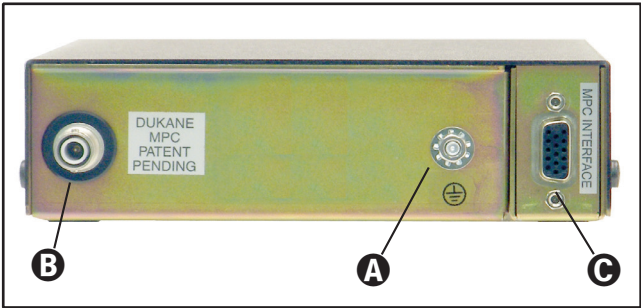


Figure 11-5 MPC Interface Rear Connectors

Front Connections

Refer to Figure 11 -6 below.

Complete these connections.

- 1. Probe Cable(s) - Beginning with PROBE 1, connect one end of the cable (See Table 11-IV below.) to the U/S connector on the MPC's front panel, **D** in Figure 11 -6. Connect the other end of the cable to the corresponding probe for your specific welding application.
- 2. Repeat Step 1 for each of the remaining probes (in sequence: 2, 3, 4, etc.) in your system.

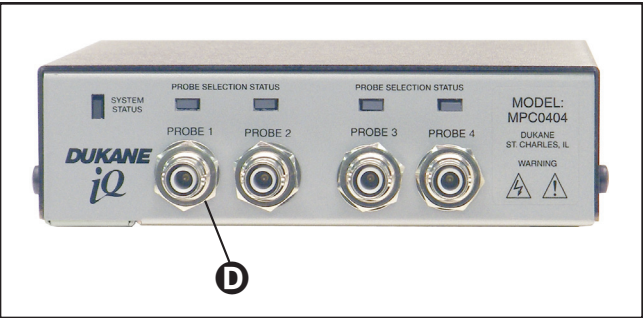


Figure 11-6 MPC Interface Front Connectors

System Frequency	Probe P/N	Cable P/N : MPC to Probe
20kHz	41C25	200-479-XX
	41C27	
30kHz	41A60R-129	200-615-XX
40kHz	41A40	

Table 11-IV Probe Cables

Continued

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MPC Interface Status LEDs

System Status

When the system is powered and ready, the front panel SYSTEM STATUS LED lights up, and becomes GREEN (**E** in Figure 11-7).

If this LED is lit with a YELLOW/ORANGE color, a recoverable fault condition has tripped. This indicates that the system is operational, but a fault condition has occurred preventing normal operation. Examples of this type of fault would be a generator overload that will automatically reset when the next weld cycle begins, or the automation control system is selecting a channel that doesn't exist - for instance, trying to select channel 10 for an 8 channel system

If this LED lights up RED, a hardware fault has been sensed, and the unit should be returned to Dukane for servicing.

Probe Selection Status

The PROBE SELECTION STATUS LED (**F** in Figure 11-7) lights up GREEN indicating it is the selected probe.

A probe's LED turns to RED (from GREEN) when ultrasonic power is activated.

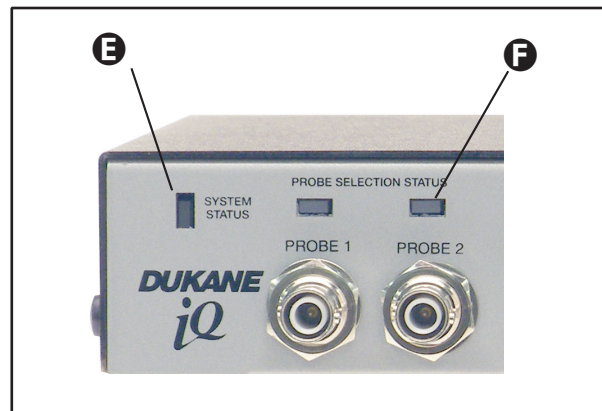


Figure 11-7 MPC Interface Status LEDs

Continued

MPC Cycle Illustration

The flow chart below illustrates a typical welding cycle when the MPC feature is used.

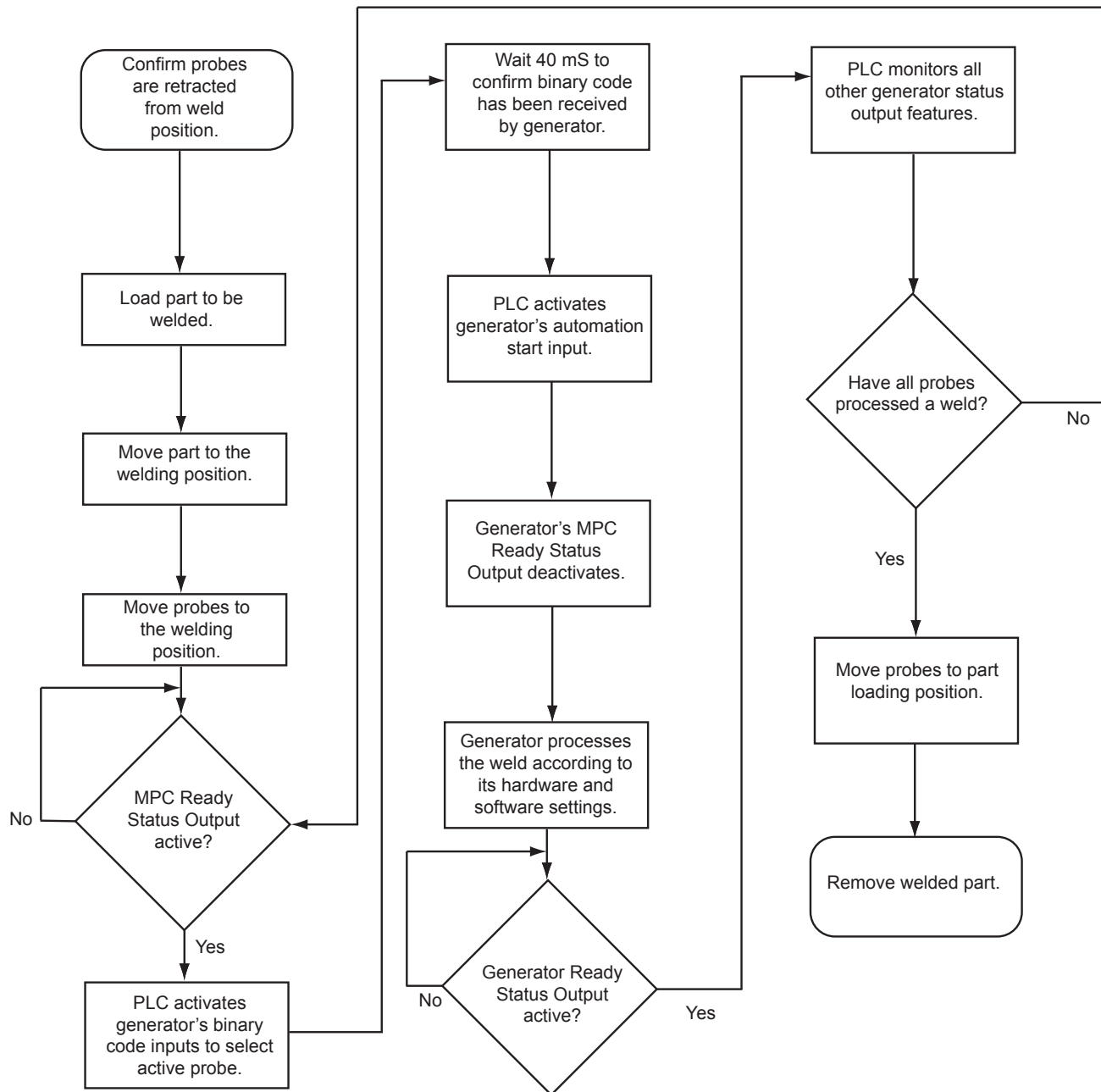


Figure 11-8 MPC Cycle Flow Chart

Remote Amplitude Control Module and EtherNet/IP

Part Number - 110-4183 or
110-4589 for 3600W and 4800W
High Power Units

This optional module combines the EtherNet/IP and Remote Amplitude Control interfaces. See Pages 31-32 for information on the EtherNet/IP connector.

This module enables remote control of output amplitude of the *iQ* system. The control interface is a 4–20mA current loop. The current loop connector and fault indicator are shown below in Figure 11–10. The output can be adjusted from 36% to 100%. The scale factor is a 4% amplitude change for each mA change. A graph of amplitude output as a function of loop current is shown in Figure 11-9. The current loop compliance voltage is 6 volts minimum.

Failure to provide at least 4mA of loop current is sensed as a fault and will produce minimum amplitude output.

The current loop fault indicator is a bi-color LED. It is green when the current is between 4 and 20mA and red when the current is below 2mA.

Current Loop Fault

If a current loop source is not available, an external +24VDC power supply can be connected to the POS and NEG terminals of J7. (See Figure 11-11.) A +22VDC supply is also available on System Output Pins 1(+) and 3(-).

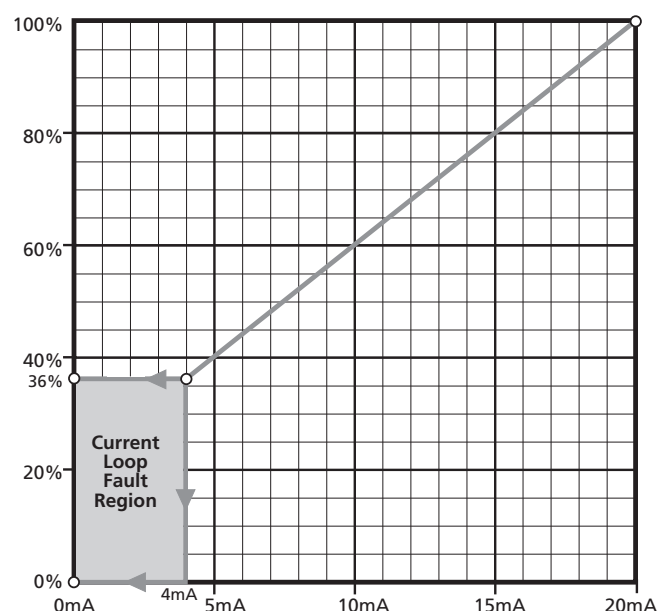


Figure 11-9 Current Loop Transfer Function Graph

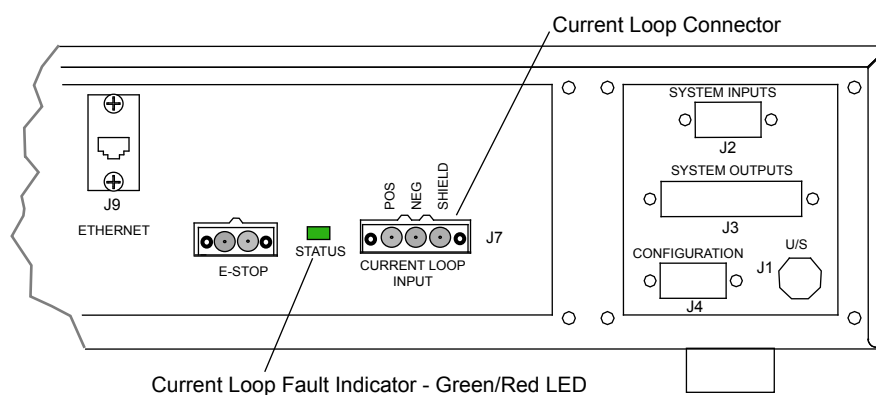


Figure 11-10 Generator Rear View - Optional Remote Amplitude Control Module

Continued

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Menu Selections

With the optional Remote Amplitude Control Module installed, the generator detects the module. As a result, the front panel screens appear as shown in Figure 11-11 below.

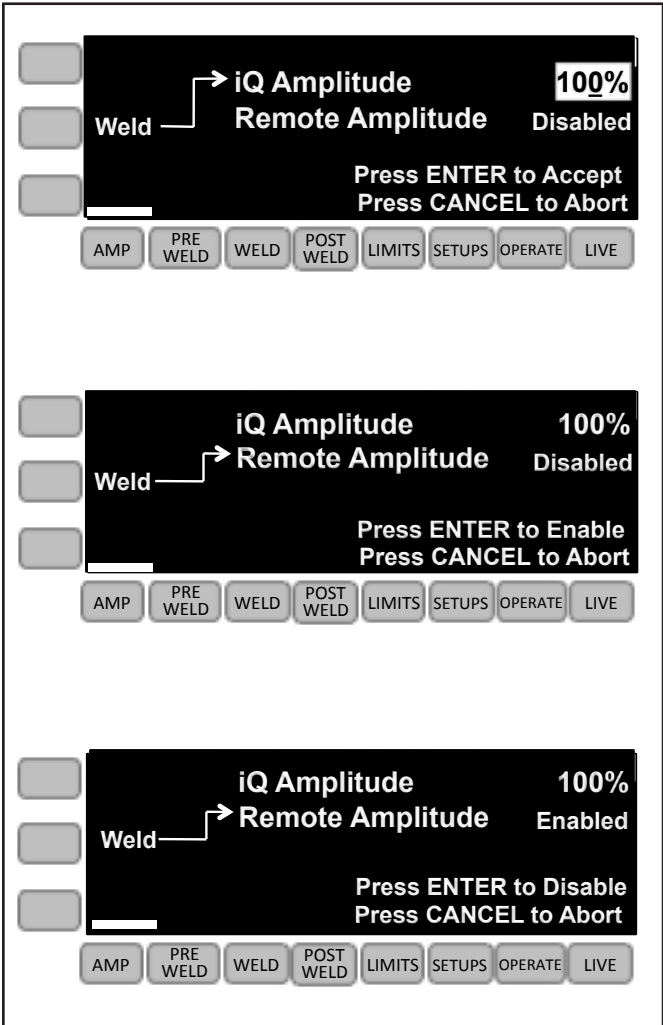


Figure 11-11 Remote Amplitude Control Menus Detail

Automation Thruster Control Module

Part Number - 110-4206

This optional module enables the *iQ* system to control a Dukane *iQ* thruster. The module is illustrated in Figure 11-12. Check your thruster operator's manual for cable connection information.

J5 is the HD-26 pin basic thruster connector and J6 is a DB-9 abort switch connector. Figures 11-13 and 11-14 identify pin numbers for J6 and J5, respectively.

The Automation Thruster Control Input (J2 pin 9) is used to control the up and down movement of the thruster. If this input is deactivated (default), the thruster will remain in the up position. When the input is activated,

the thruster will descend to the down position at a speed that is determined by the pressure regulator setting on the front of the thruster.

NOTE

It is the responsibility of the machine builder to ensure that all appropriate safety regulations are met when using the Thruster Control Module in an automated system. A light curtain or similar safety guarding should be used to prevent operator injury.

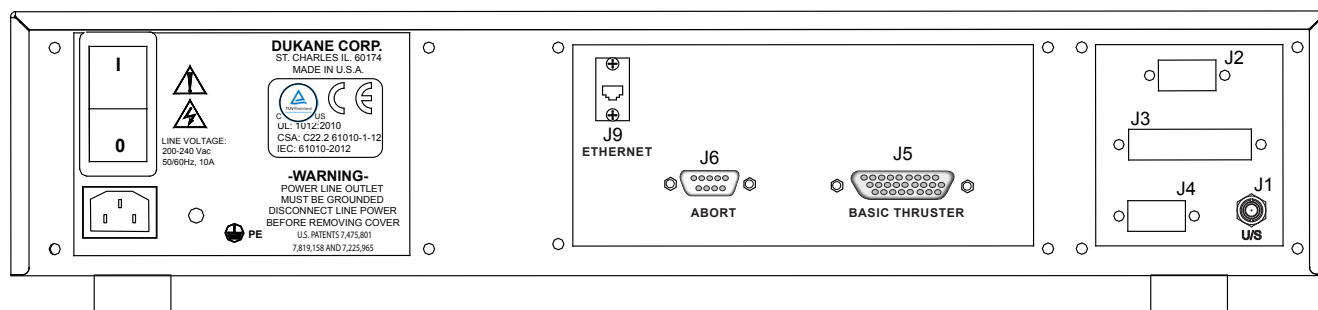


Figure 11-12 Generator Rear View - Optional Automation Thruster Control Module

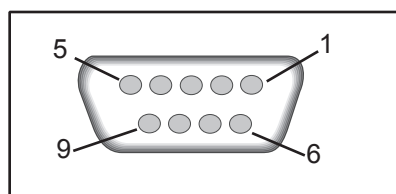


Figure 11-13 DB-9 Connector with Pin Locations (J6)

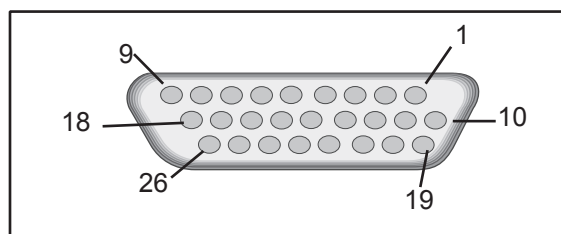


Figure 11-14 HD-26 Connector with Pin Locations (J5)

Pin No.	Input/Output	Function	Signal Types
1			Not Used
2			Not Used
3	Input	Hardware Abort Power In	Normally closed emergency switch contact
4	Input	Software Abort	Normally open dry contact switch closure to ground
5		Press Inhibit (Gnd)	Safety signal
6			Not Used
7	Ground	Ground	Internal ground
8			Not Used
9	Output	Hardware Abort Power Out	Normally closed emergency switch contact

Table 11 - V Abort Connector Pinout (J6)

Continued

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To enable the thruster, Pins 3 and 9 must be shorted together through a safety circuit (see Table 11-V) during normal operation.

During an abort or emergency stop condition, the connection between Pins 3 and 9 must open to disable movement of the thruster. In addition to opening the connection between Pins 3 and 9, Pins 4 and 7 must be shorted together to alert the process controller of the condition.

The accessory cable for J5 is Part No. 200-1413-XX.

The accessory cable for J6 is Part No. 200-1546-XX (where XX is a length designation).



iQ LinQ communication options allow automated systems to monitor and change settings in **iQ** generators. These options provide machine builders the ability to integrate the generator into an electrical cabinet and to use the machine's HMI to program or monitor weld settings.

All Dukane **iQ** LS-E generators include the EtherNet/IP Interface connector, which can be used to set amplitude and monitor power. Using this interface avoids adding expensive analog cards into PLC racks. (See Pages 31-32 for more information about the EtherNet/IP connector.)

iQ LinQ also provides a cost effective solution for adding the Weld by Energy feature that is only available in the more advanced **iQ** generators. In addition to EtherNet/IP, **iQ LinQ** is also available for PROFIBUS and the RS-232 interface.

iQ LinQ solutions are available to provide complete ladder logic and HMI screens that can be dropped into Allen Bradley (RSLogix 5000) and Siemens (Step 7) PLC projects. Contact your local Dukane representative for more information about the **iQ LinQ** options.

iQ LinQ RS-232 Interface Option

The RS-232 Interface option allows the **iQ** generator to connect to a PLC's serial port. Each generator requires a dedicated connection to automation, so it is not possible to daisy-chain or bus multiple generators on a single RS-232 connection.

Control Parameters Available via RS-232

(Time [only] option)

1. Set these parameters: Weld Time, Amplitude, Ramp Up Time, and Ramp Down Time.
2. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be Obtained via RS-232

(Time [only] option)

1. All control parameters that are configured via RS-232.
2. Real time data that includes welder state (ultrasound active or not), frequency, power, and amplitude.

Control Parameters Available via RS-232

(Time and Energy option)

1. Set weld method to Time, Energy, or Peak Power. Set associated values in seconds, joules, or watts.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power parameters.
4. Enable and set Hold Time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power and/or Energy.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power and/or Energy.
8. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be Obtained via RS-232

(Time and Energy option)

1. All control parameters that are configured via RS-232.
2. Real time data that includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld that includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy
 - Peak Power

For information on how to control and/or monitor specific parameters, **iQ** Generator RS-232 Communication and Control documentation is available.

Signing a non-disclosure agreement is required to obtain this documentation.

iQLinQ™ PROFIBUS Communications Module

Part Number - 110-4554

See Figure 11-15 below. The PROFIBUS option module allows the *iQ* generator to connect to a PROFIBUS network. Since PROFIBUS is multipoint instead of point-to-point, more than one generator can be connected to a single bus cable. The PROFIBUS module offers access to generator parameter settings and status information listed below. In addition, if desired, all I/O wiring can be replaced with a single PROFIBUS cable.

Control Parameters Available via PROFIBUS

1. Set weld method to Time, Energy, or Peak Power. Set associated values in seconds, joules, or watts.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power parameters.
4. Enable and set Hold Time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power and/or Energy.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power and/or Energy.
8. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency limits.

Parameters Available via PROFIBUS

1. All parameters that are configured via PROFIBUS
2. Real time data which includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld which includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy (Time and Energy option)
 - Peak Power

For information on how to control and/or monitor specific parameters, *iQ* Generator PROFIBUS Communication and Control documentation is available.

Signing a non-disclosure agreement is required to obtain this documentation.

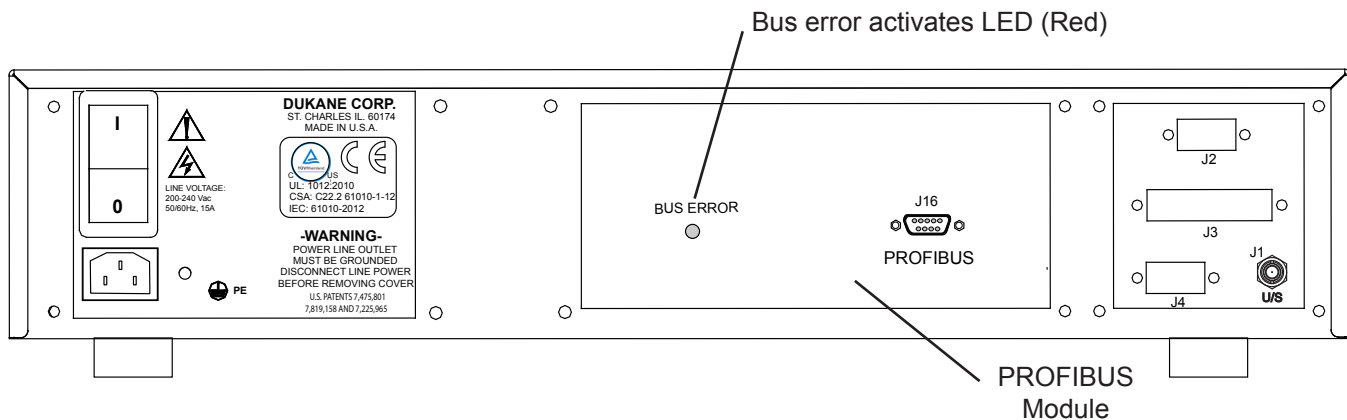


Figure 11-15 Generator Rear View - Optional PROFIBUS Communications Module

SECTION 12

Contacting Dukane

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service-related problem, be prepared to give the following information:

- Model number, line voltage and serial number
- Alarm/Fault indicators from the display
- Software version (Press **INFO**. With selection indicators at **System Information**, press **ENTER** to get this data.)
- Problem description and steps taken to resolve it

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 USA

Phone: (630) 797-4900

E-Mail: ussales@dukane.com

Fax:

Main	(630) 797-4949
Service & Parts	(630) 584-0796

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature. This is our main web address:

www.dukane.com/us/

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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SECTION 13

Specifications

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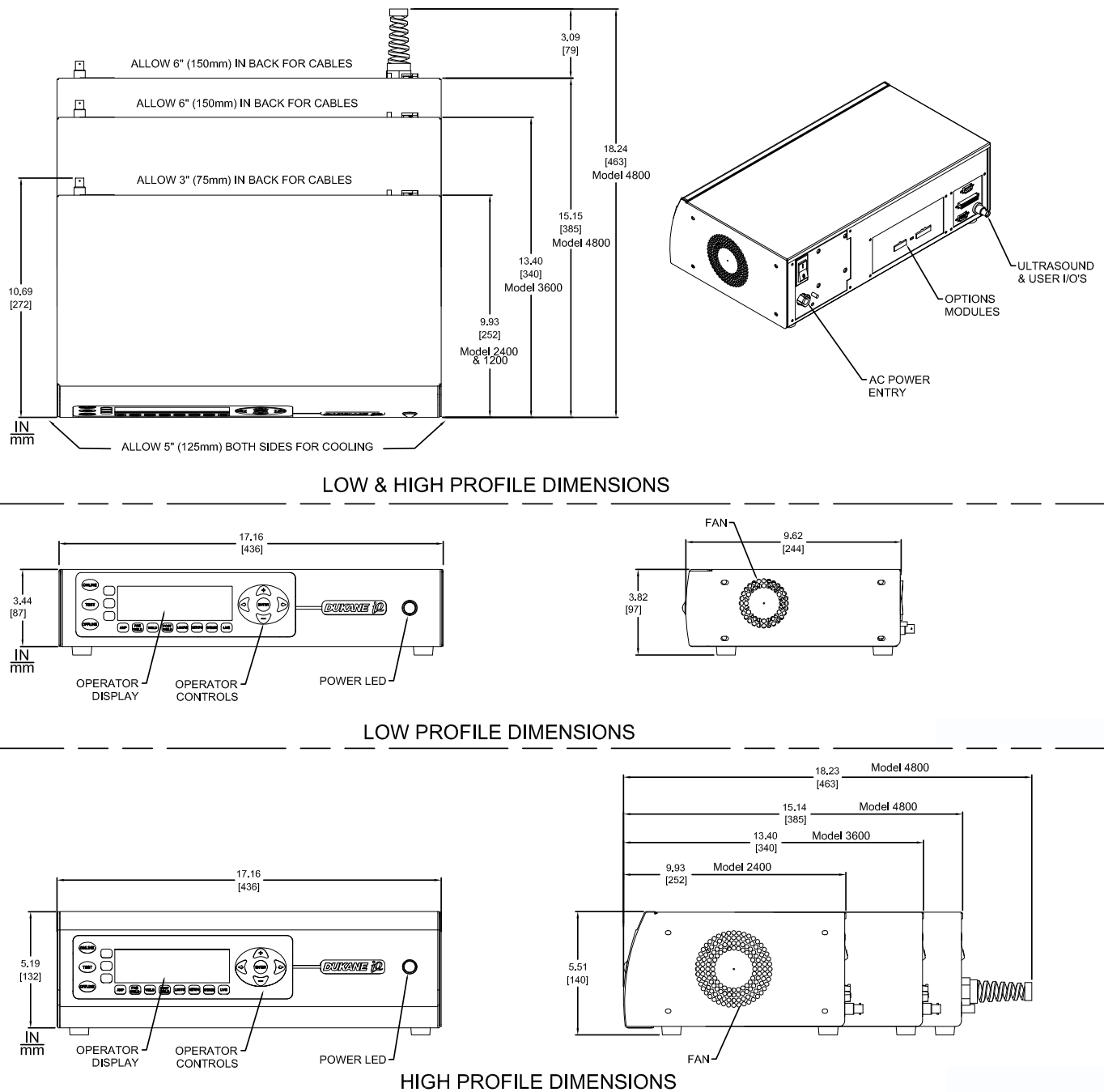


Figure 13-1 Low and High Profile Generators Drawing

Weights

	High Profile		Low Profile		High Power 3600W		High Power 4800W	
	lb	kg	lb	kg	lb	kg	lb	kg
Generator Only	25	11.3	23	10.4	32	14.5	34	15.4
Generator + Packing Materials	30	13.6	28	12.7	37	16.8	39	17.7

Table 13-I *iQ* Generator Weights

Operating Environment

Operate the generator within these guidelines:

Temperature: 40°F to 100°F (+4°C to +38°C)

Air Particulates: Keep the equipment dry
Minimize exposure to moisture, dust, dirt, smoke
and mold

Humidity: 5% to 95% Non-condensing @ +5°C to +30°C

Storage guidelines (generator is not operating):

Temperature: -4°F to 158°F (-20°C to +70°C)

Air Particulates: Keep the equipment dry
Minimize exposure to moisture, dust, dirt, smoke
and mold

Humidity: 5% to 95% Non-condensing @ 0°C to +30°C

AC Power Requirements

Generator

The AC line voltage and current needed depend on whichever generator has been chosen for your system. See the table below.

Operating Frequency	Generator Model Number	Overload Power Ratings (Watts)	Input AC Power Requirements Nominal AC Volt @ Maximum RMS Current	North America/ Japan AC Outlet Rating	Output Voltage (Max)	Output Current (Max)
15KHz	15HB360-2-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps	1400 VAC (Nominal)	5 A (Nominal)
15KHz	15HB480-2-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps		1400 VAC (Nominal)	5 A (Nominal)
20KHz	20HB120-1-XX-XX	1200	**100-120V 50/60 Hz @ 15 Amps	15 Amps	700 - 1300 VAC (Nominal)	1.5 - 3 A (Nominal)
20KHz	20HB120-2-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps			
20KHz	20HB180-2-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps			
20KHz	20HB240-2-XX-XX	2400	200-240V 50/60 Hz @ 15 Amps			
20KHz	20HB360-2-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps	1400 VAC (Nominal)	5 A (Nominal)
20KHz	20HB480-2-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps			
30KHz	30HB090-1-XX-XX	900	100-120V 50/60 Hz @ 8 Amps	15 Amps	700 - 1300 VAC (Nominal)	1.5 - 3 A (Nominal)
30KHz	30HB090-2-XX-XX	900	200-240V 50/60 Hz @ 8 Amps			
30KHz	30HB120-1-XX-XX	1200	**100-120V 50/60 Hz @ 15 Amps			
30KHz	30HB120-2-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps			
30KHz	30HB180-2-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps			
40KHz	40HB060-1-XX-XX	600	100-120V 50/60 Hz @ 8 Amps			
40KHz	40HB060-2-XX-XX	600	200-240V 50/60 Hz @ 5 Amps			
40KHz	40HB090-1-XX-XX	900	100-120V 50/60 Hz @ 15 Amps			
40KHz	40HB090-2-XX-XX	900	200-240V 50/60 Hz @ 8 Amps			
40KHz	40HB120-1-XX-XX	1200	**100-120V 50/60 Hz @ 15 Amps			
40KHz	40HB120-2-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps			

Table 13-II Generator AC Power Requirements

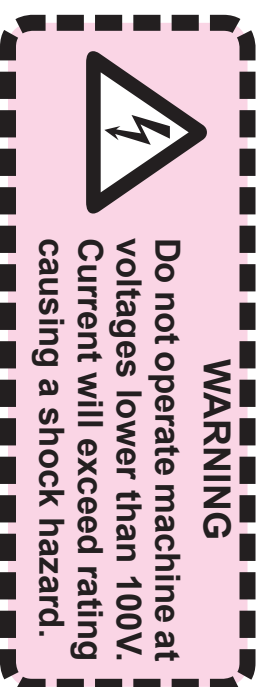
NOTES:

An X used above in the Model Numbers is a "wildcard" character meaning any valid character code combination.

Maximum line current requirement is specified at the minimum nominal AC line voltage and the rated power level.

♦ is used to represent the front panel series. "V" is Time only; "G" is Time and Energy.

**If the input line voltage is less than 100V, the output current will exceed 15 Amps.



Ultrasonic Pressure

Ultrasonic Pressure					
<i>iQ</i> Generator Models - kHz	15	20	30	40	50
Useful Beam	360 degrees				
Ultrasonic Pressure @ Operator's Position - dB	125	140	130	130	130
Ultrasonic Pressure 1 m from the Equipment- dB	110	130	110	105	110

Table 13–III *iQ* Generator Ultrasonic Pressure

NOTE

All measurements taken with Data Physics Dynamic 4-Channel Signal Analyzer with calibrated 377C01 Microphone and 426B02 Preamplifier.

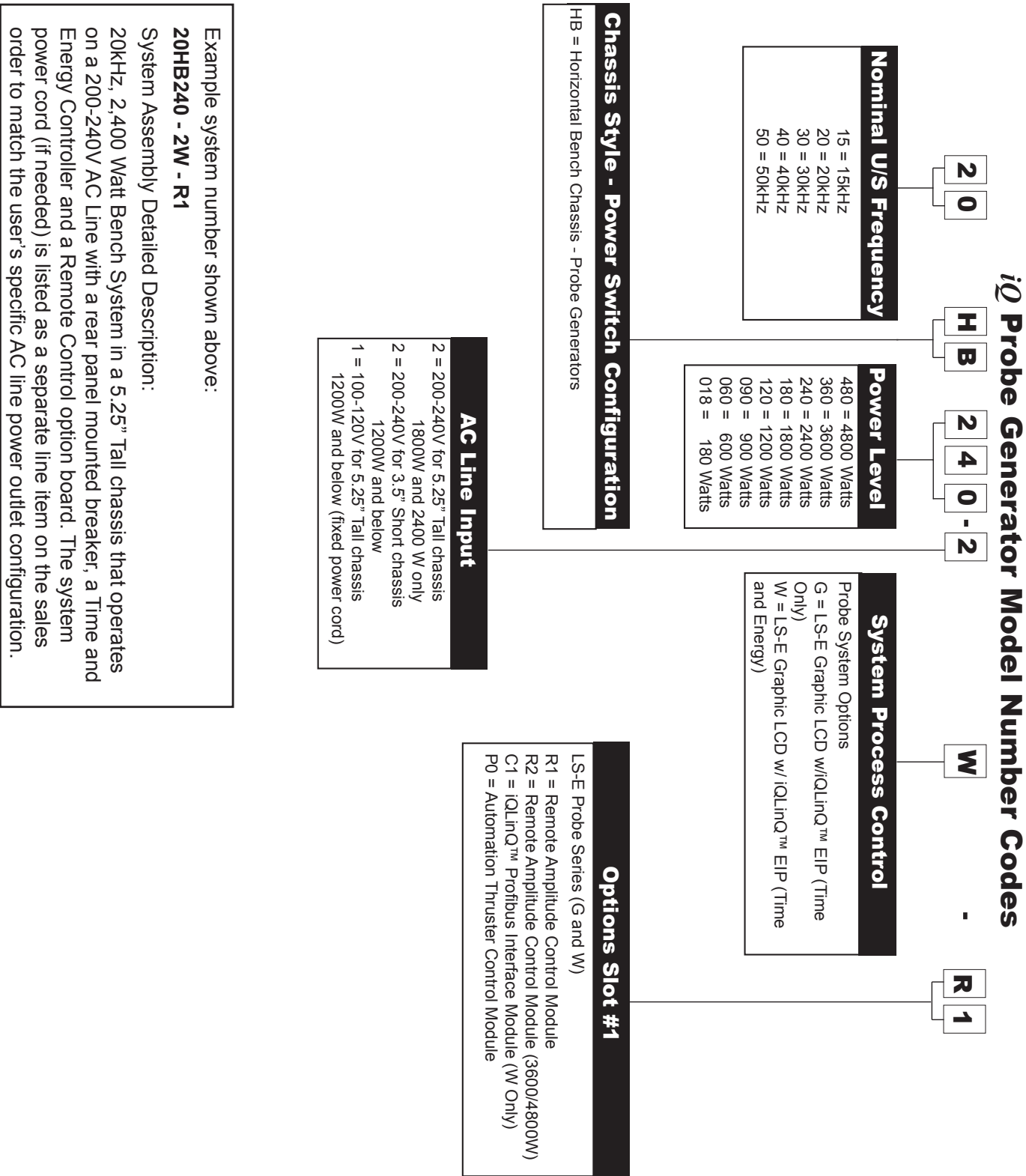


Figure 13-2 Interpreting the Model Number

Regulatory Agency Compliance

FCC

The generator complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, “Methods of Measurement of Radio Noise Emissions from ISM Equipment”, pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

CE Marking

This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Européenne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
EN 61000-6-4: 2001
EN 55011: 2003
EN 61000-6-2: 2005
EN61000-4-2
EN61000-4-3
EN61000-4-4
EN61000-4-5
EN61000-4-6
EN61000-4-8
EN61000-4-11
- The Low Voltage Directive 2006/95/EC.
- The Machinery Directive 2006/42/EC.
EN 60204: 2006
Safety of Machinery - Electrical Equipment of Machines Part 1: General Requirements.

IP Rating

The *iQ* generator has an IP (International Protection) rating from the IEC (International Electrotechnical Commission).

The rating is IP2X, in compliance with finger-safe industry standards.

UL

The *iQ* generator complies with these standards:

Underwriters Laboratories:

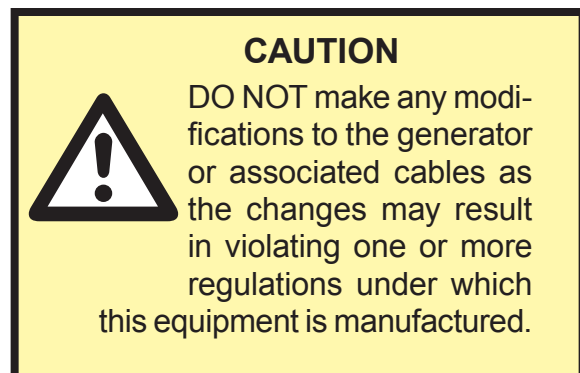
UL 1012: 2010

UL 61010-1:2012, and

National Standards of Canada:

CAN/CSA C22.2 No. 61010-1-12:2012

as verified by TÜV Rheinland.



System Parameter Settings Overview

This section provides the default system settings programmed at the factory. Some of these system parameter settings are dependent on the nominal system operating frequency while other parameters are independent of the frequency. The default settings should work with over 90% of the ultrasonic loads and welding applications that might be encountered. In some cases, adjusting the system setup parameters might enable the system to drive difficult or unusual loads, which would not be possible with the standard system settings.

In addition to the default system parameter settings, a list of user-adjustable settings is included.

NOTE

An ultrasonic stack will not operate if the mechanical resonance is outside of the frequency limits.

Default System Parameter Settings

Default Frequency Dependent Settings

Setting Description	15kHz	20kHz	30kHz	40kHz
Free Running Frequency Setting (Hz)	15,000	19,900	30,000	40,000
Upper Frequency Limit Setting (Hz)	15,400	20,400	30,500	40,500
Lower Frequency Limit Setting (Hz)	14,600	19,400	29,500	39,500
Ramp-up Time Setting (sec.)	0.250	0.150	0.100	0.050

Table 13-IV Default Frequency Dependent Settings

Default Frequency Independent Settings

Setting Description	Default Setting for All Frequencies
Amplitude Setting for Weld and Test (Percent)	100% (maximum user adjustment limit)
Output Activation Duration Process Status	Maintained (activates until next weld cycle starts)
Cycle Start Input Delay Time	Solid State (0.0msec. delay time)
Programmable Status Output #1 Default Assignment	OVERTEMP Status (J3 Pin 4 System Output)
Programmable Status Output #2 Default Assignment	Hold Status (J3 Pin 5 System Output)

Table 13-V Default Frequency Independent Settings

Continued

Continued from Previous Page

System Parameter Adjustment Limits

Setting Description User Adjustment Limit	Setting Ranges for All Frequencies	
	Minimum	Maximum
Amplitude Setting	20%	100%
Free Run Frequency ***	Default Free Run Frequency minus 500 Hz	Default Free Run Frequency plus 500 Hz
Ramp-up Time	0.010 second	1.250 second

Table 13-VI System Parameter Adjustment Limits

*** NOTE: Free Run Frequency for 15kHz generators,
Minimum = Default Free Run Frequency minus 600 Hz;
Maximum = Default Free Run Frequency plus 600 Hz.

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Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well-defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection-oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.



View the Dukane ISO certificate of compliance at: <http://www.dukane.com/ISORegistrationCertificate.pdf>

Please refer to our website at:
www.dukane.com/us/sales/intsales.htm
to locate your local representative.

